

HYDROLOGIC ANALYSIS OF MOUNTAIN RUN 11 AND MOUNTAIN RUN 50 WATERSHED AND DAMS

Background

Mountain Run stream originates in the western part of Culpeper county and flows generally east through the Town of Culpeper (Town) and emptying into the Rappahanock River. The Mountain Run Watershed is located west of the Town of Culpeper. A Watershed Plan was developed by the NRCS (formerly the Soil Conservation Service) in the 1950s and supplemented in the 1970s to reduce flood flow in and around the Town and to provide water supply storage for the Town. Five watershed structures are located in the Mountain Run Watershed. Mountain Run Dam No. 50 and 11 are currently in planning for rehabilitation to meet current state dam safety requirements, maintain existing flood control and maintain existing water supply storage.

Table 1: Summary of Mountain Run Watershed Dams

Dam	Mountain Run No. 50	Mountain Run No. 11	Mountain Run No. 13	Mountain Run No. 18	Mountain Run No. 8a
Name	Pelham Lake	Mountain Run Lake	Merrimac Lake	Catalpa Lake	Caynor Lake
Owner	Town Of Culpeper	Town Of Culpeper	Culpeper SWCD	Culpeper SWCD	Culpeper SWCD
Year Built	1973	1959	1960	1973	1959
Purpose	Flood Protection & Water Supply	Flood Protection & Water Supply	Flood Protection	Flood Protection & Water Supply	Flood Protection
Design Hazard	H	L	L	H	L
Current Hazard	H	H	L	H	L
Stream	Mountain Run	Mountain Run	Hungry Run	Ball Run	Tr-Mountain Run

The hydrology methods used to develop the design hydrographs were in accordance with NRCS policy and procedures. National Engineering Handbook, Part 630, Hydrology, and Technical Release 60 (TR-60), Earth Dams and Reservoirs, describes in depth the hydrologic procedures utilized for analysis. The NRCS computer program, SITES, was used to model watershed runoff from design rainfall events and route the resulting hydrographs through the dams. SITES hydraulically proportions the principal spillways and auxiliary spillways of dams in accordance with TR-60 criteria.

Supporting documentation, including maps, watershed parameters, structure tables, sediment survey reports, SITES models, and hydrograph development, is attached in the appropriate Appendices.

Precipitation Values

Rainfall amounts were determined as specified by TR-60. Current precipitation data is contained in NOAA Atlas 14, *Precipitation Frequency Atlas for the United States, Volume 2 – The Ohio River Basin and Surrounding States* (2004) and in NOAA *Hydrometeorological Report No. 51, Probable Maximum Precipitation Estimates, United States East of the 105th Meridian* (June 1978). These values were used in the SITES routing of the 100-year, 10 day Principal Spillway Hydrograph (PSH), the 24-Hr Freeboard Hydrograph (FBH) and the 6-Hr FBH. These precipitation values are shown in the below table.

Table 2: Precipitation Data Used in Analysis

Description	Design Hydrograph	Duration (hrs)	Amount (in)	Source
100-year	PSH (rainfall)	1-day	8.53	Atlas 14
100-year	PSH (rainfall)	10-day	12.7	Atlas 14
100-year	PSH (runoff)	1-day	3.1	TR-60
100-year	PSH (runoff)	10-day	6.2	TR-60
ASW capacity and Integrity (PMP)	FBH	6	28.0	HMR-51
ASW capacity and Integrity (PMP)	FBH	12	33.0	HMR-51
ASW capacity and Integrity (PMP)	FBH	24	36.0	HMR-51

Storage

The stage-area curves for both Mountain Run 50 and Mountain Run 11 were prepared using field surveys of the pools and dams and the VGIN 2013 VBMP digital terrain models. Sediment Survey reports for each dam were prepared by the NRCS geologist.

Watershed Characteristics

An existing SITES hydrologic model was developed to estimate the design flows and to correlate frequent flood events to stream gage data. Current watershed data was collected using the most recent GIS data including the National Land Cover Dataset (NLCD 2011), digital terrain models (VGIN, 2013 VBMP), and Soil Survey Geographic Database (SSURGO 2014). Future land use provided by Culpeper County indicates that very little change in landuse in the Mountain Run watershed is projected in the next 20 years.

Mountain Run 11 has a drainage area of approximately 6.5 square miles. The runoff curve number (RCN) and time of concentration (T_c) used were 67 and 2.71 hours, respectively. Mountain Run 50 has a drainage area of approximately 26.2 square miles. The overall RCN and T_c is 68 and approximately 9 hours, respectively.

Note that for both Mountain Run 11 and 50, the existing RCN is less than the original design RCN. The difference is attributed to a change of landuse in the watershed, mainly an increase in woody areas. Also note that the T_c decreased substantially, which is primarily due to more accurate methods using GIS DTMs.

Figure 1: Mountain Run Watershed SITES Schematic

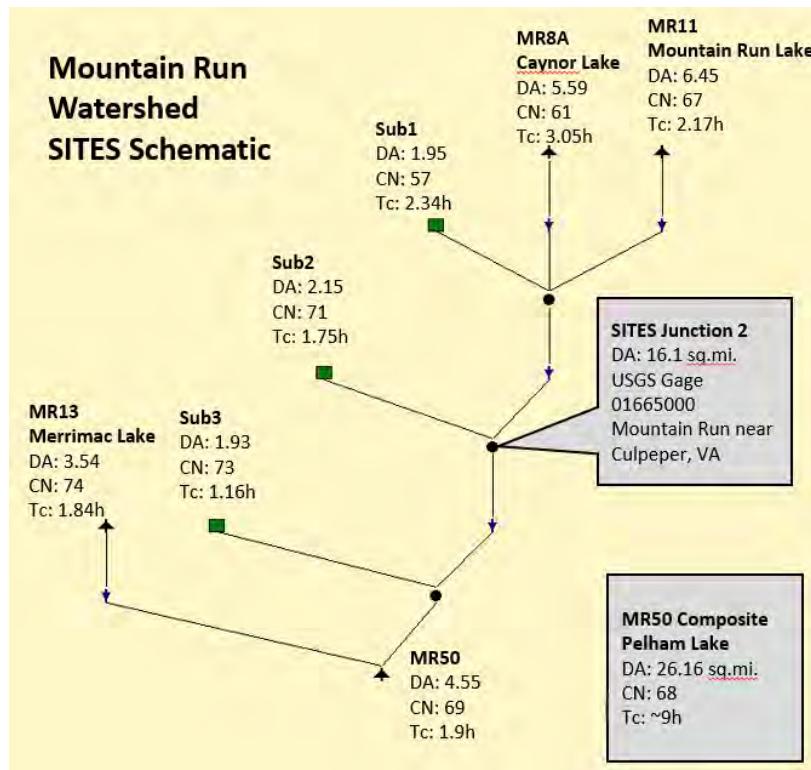


Table 3: Summary of Sub-Watershed Data

Name	Existing Data			Original Design Data		
	Drainage Area (sq.mi.)	TC (hrs)	RCN	Drainage Area (sq.mi.)	TC (hrs)	RCN
MR8A Dam	5.59	3.05	61	5	4.3	71
MR11 Dam	6.45	2.71	67	5.86	4.03	71
MR50_sub1	1.95	2.34	57	NA	-	-
MR50_sub2	2.15	1.75	71	NA	-	-
JCT 2 (Stream Gage)	16.1	-	-	NA	-	-
MR50_sub3	1.93	1.16	73	NA		
MR13 (Dam)	3.54	1.84	74	3.22	3.59	71
MR50_sub4 (MR50 dam)	4.55	1.89	75	9.82	4.6	69
TOTAL Watershed to MR50	26.16	~9	68	23.9	-	70

Table 4: Summary of Reach Data

Reach	Description	Length (ft)	Slope (ft/ft)	Travel Time (min)
R8A	Structure 8A to Jct1	10,380	0.0028	46
MR2	Jct 1 to Jct2	5,339	0.0013	18
MR3	Jct 2 to Normal Pool of Structure 50	6,074	0.0008	40
R11	Structure 11 to Jct1	7,865	0.0015	31
R13	Structure 13 to Normal Pool of Structure 50	2,753	0.0010	28

Design Hydrographs

The SITES model was used to develop the design hydrographs, route the flood flows through the watershed, and hydraulically proportion the dam and spillways. The SITES results are attached.

Principal Spillway Hydrograph

TR-60 requires the 100-year, 10 day storm be used to design the principal spillway capacity, retarding storage, and vegetated auxiliary spillway crest. There are two procedures for estimating the runoff volumes for the Principal Spillway Hydrograph (PSH). The procedure that requires the higher auxiliary spillway crest elevation is the controlling PSH. For both Mountain Run 11 and 50, the runoff curve number procedure (PSH-rainfall) resulted in the higher crest.

The PSH runoff volume is modified to account for baseflow and quick return flow (QRF). The QRF is a constant rate of discharge that is added to the PSH as direct runoff. For both Mountain Run 11 and 50, there is a large baseflow and QRF due to the large drainage areas. This modified PSH runoff volume is used to check the 10-day drawdown requirement and to set the starting water surface elevations to route the Auxiliary Spillway Hydrographs (SDH) and the Freeboard Hydrographs (FBH). TR-60 criteria states that the principal spillway capacity should be adequate to empty the retarding pool in 10 days or less. This is considered met if 15% or less of the maximum volume of retarding storage remains after 10 days.

For both Mountain Run 11 and 50, PSH results show that existing principal spillway capacity is not large enough to evacuate 85% of the detention volume. If 85% of the detention volume between the principal spillway crest and vegetated auxiliary spillway crest is not evacuated in 10 days, TR-60 requires the elevation of the vegetated auxiliary spillway to be raised. The raised crest elevation is determined by adding the remaining retarding storage volume to the initial retarding storage volume. This is fairly extensive raise for both Mountain Run 11 and 50.

Alternatives to raising the crest of the vegetated auxiliary spillway include increasing the capacity of the principal spillway or to install a structural spillway. A structural spillway can be operated more frequently than a vegetated auxiliary spillway, so the existing auxiliary crest elevations can be maintained.

Table 5: PSH Results

PSH Value	Mountain Run 11	Mountain Run 50
Drainage Area (sm)	6.45	26.16
Quick Return Flow (cfs)	39	157
Baseflow (cfs)	6	23
PSH Peak Inflow (cfs)	6,622	11,804
Initial Reservoir Elevation (ft)	434.74	385.18
ASW crest after PSH routing and 10-day drawdown check (ft)	445.84	393.48
ASW crest raise (ft)	1.7	3.2

Freeboard Hydrograph

TR-60 critical freeboard hydrograph (FBH) criteria for storm duration and rainfall distributions were used to develop the FBH for both Mountain Run 11 and Mountain Run 50. TR-60 requires that both a short duration (6-hour or longer) and a long duration (24-hour or longer) storm be analyzed and the more critical results be used to check the discharge capacity and the integrity of the vegetated auxiliary spillway. For the 6-hour storm, the dimensionless distribution shown in TR-60, Figure 2-4, was used. For the 24-hour storm, the NRCS 5-point rainfall distribution was used.

For Mountain Run 11, the existing SITES model shows that the 6-hr FBH is the critical hydrograph for capacity and integrity. The computed 6-hr FBH peak inflow is 26,900 cfs with a peak stage of 454.72, 4.7 feet higher than the existing dam crest elevation of 450.0.

The watershed to Mountain Run 50 includes three upstream structures (Mountain Run 8A, 11 and 13). Therefore the design of the Mountain Run 50 structure must account for the upstream dams. TR-60 criteria requires that the height of dam and integrity is based upon a combined hydrograph from the upstream controlled drainage areas (MR8A, MR11, MR13) and the uncontrolled drainage areas (MR50_sub1, MR50_sub2, MR50_sub3, MR50_sub4). The existing SITES model shows that the 24-hr FBH is the critical hydrograph for capacity and integrity.

The results also show that the upstream dams overtop between 3.7 to 4.4 feet and Mountain Run 50 overtops by 2.4 feet. TR-60 requires that if the upper dams are overtopped, the dams are considered breached and the resulting breach hydrograph is routed to the lower dam. The dam breach hydrographs for the three upstream structures were developed using the TR-60 dam breach criteria and TR-66 breach hydrograph criteria.

For Mountain Run 50, the design FBH includes the 24-hr FBH of the watershed and the breach hydrograph of the three upper dams. The computed FBH peak inflow is 72,800 cfs with a peak stage of 406.43 feet, 4.2 feet higher than the existing dam crest elevation of 402.2.

Model Correlation

USGS Gage 01665000-Mountain Run near Culpeper, VA has a drainage area of 16.1 square miles and is below structures 8A and 11 (Jct 2) and above structure 50. Data was collected from 1950 to 1996. Only data after the installation of the existing upstream structures was included in the stream gage frequency

analysis. The gage data 100-yr flow estimate is approximately 5,100 cfs, with a 95% confidence interval from 3,500 cfs to 8,800 cfs.

A SITES model was developed to compare the watershed parameters and peak discharges of the 100-year, 24 hour events to the stream gage frequency analysis. The NOAA Atlas 14 rainfall distribution and magnitude were utilized. The SITES model at the same hydrologic location of the USGS gage estimates 3,300 cfs for the 100-year flow. This is lower than the gage data, but close to the confidence interval. A sensitivity analysis of the time of concentration was performed and shows that the auxiliary spillway crest does not change substantially. Therefore the existing SITES model correlates to the gage data.

Summary and Recommendations

Results show that both Mountain Run 11 and 50 do not meet the 10-day drawdown requirement during the PSH events. This results in a raised vegetated auxiliary spillway crest to increase the retention volumes. This is a fairly extensive raise for both Mountain Run 11 and 50. Alternatives to raising the crest of the vegetated auxiliary spillway include increasing the capacity of the principal spillway or to install a structural spillway. A structural spillway can be operated more frequently than a vegetated auxiliary spillway, so the existing auxiliary spillway crest elevations can be maintained.

Results show that both Mountain Run 11 and 50 structures do not have the capacity to route the FBH events without overtopping the dams. This shows that the auxiliary spillway capacity and the detention storage will need to be increased for both structures. Typically, this is addressed in rehabilitation by both increasing the auxiliary spillway capacity and raising the top of dam. Analyses of the integrity and stability of the existing auxiliary spillways were not completed for this report.

Table 6: Mountain Run 11 - Summary of Design Hydrographs

Storm Event	Peak Inflow (cfs)	Peak Water Surface Elevation (ft)
PSH (100-yr, 10 day)	6,600	445.84
FBH (6-hr, NRCS-Std. Dist.)	26,900	454.72

Table 7: Mountain Run 50 - Summary of Design Hydrographs

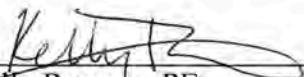
Storm Event	Peak Inflow (cfs)	Peak Water Surface Elevation (ft)
PSH (100-yr, 10 day)	11,800	393.48
FBH (24-hr, NRCS 5-pt Dist.)	72,800	406.43

Rehabilitating Mountain Run 11 and Mountain Run 50 to meet current NRCS vegetated auxiliary spillway criteria and 10-day drawdown criteria will require substantial modifications to the structures. The crests of the top of dams and auxiliary spillways will need to be raised and the widths of the auxiliary spillways will need to be increased. Structural measures to meet integrity and stability criteria will also need to be implemented.

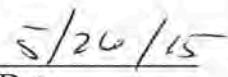
Based on the substantial amount of work involved in meeting NRCS vegetated auxiliary spillway criteria, it is recommended that structural auxiliary spillways be utilized to rehabilitate each of the structures to current NRCS criteria. The existing level of flood protection provided by the existing auxiliary spillway crest elevations could be maintained. There may need to be an increase in the top of dam elevation. A structural auxiliary spillway, such as a labyrinth weir, could be utilized to pass the design flows detailed in this report. A detailed structural analysis and design will be required to ensure that the selected auxiliary spillway alternative meets applicable NRCS criteria. With structural auxiliary spillways, TR-60 requires the structural spillway to pass the full freeboard discharge and hydraulic proportioning of the structural spillway to account for tailwater during the two-thirds freeboard discharge (TR-60, 7-4).

Authority

Prepared and Submitted

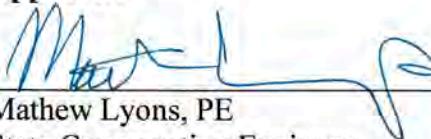


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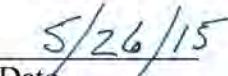


Date

Approved



Mathew Lyons, PE
State Conservation Engineer
NRCS Virginia
State Office



Date

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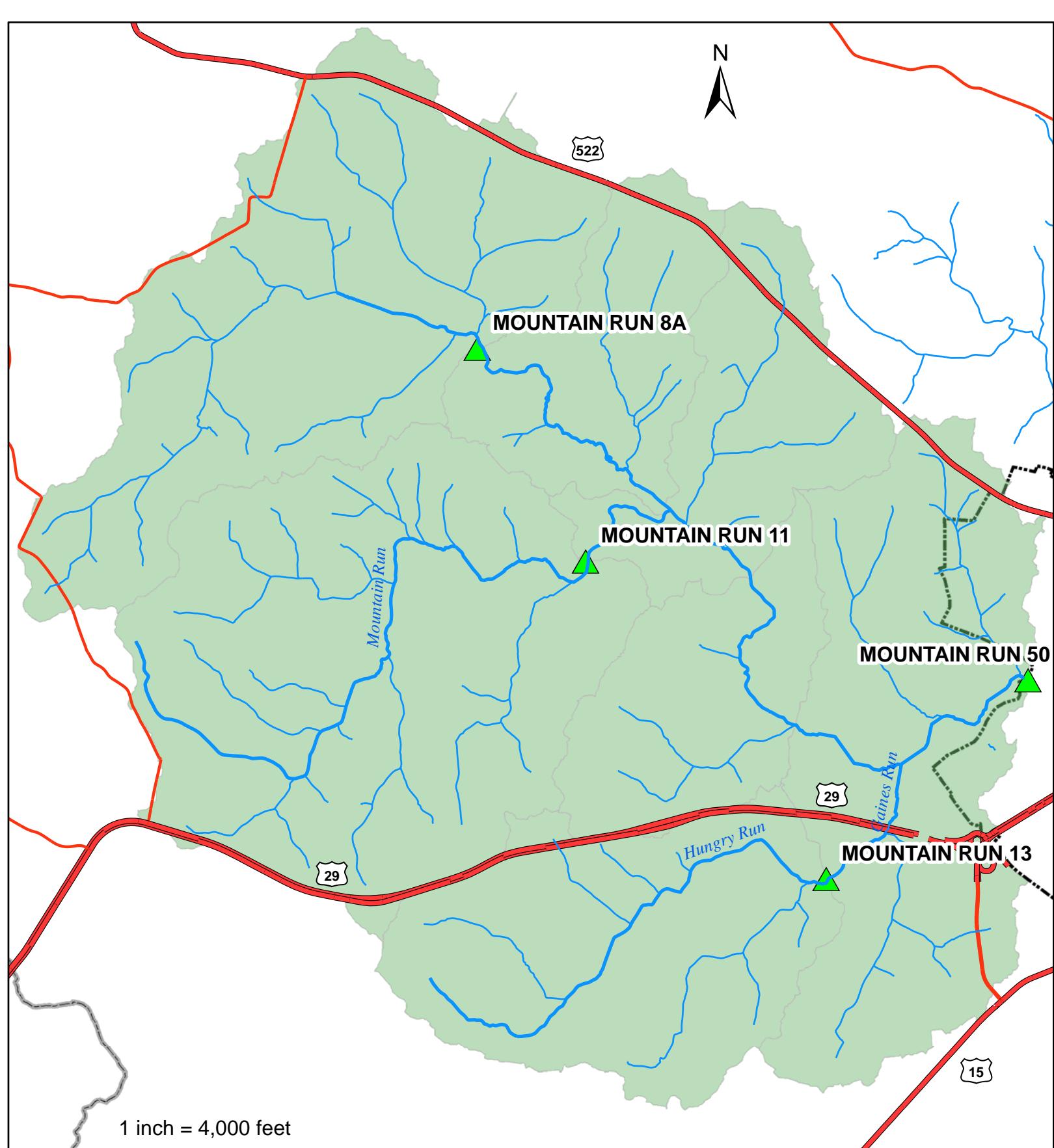
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Appendix A

Watershed Data

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1 inch = 4,000 feet



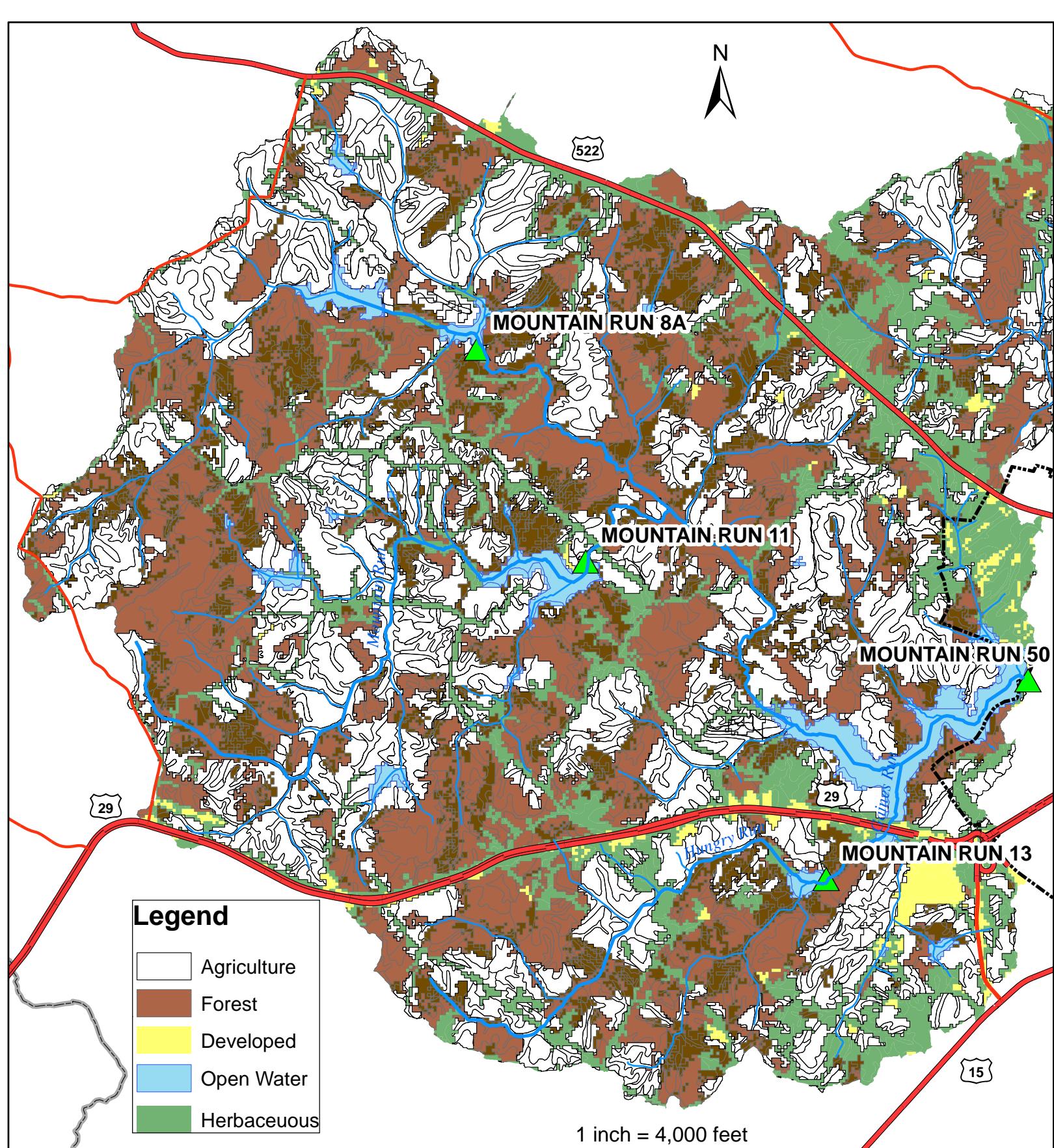
Mountain Run Watershed

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**Town of Culpeper, VA
May 2015**

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Mountain Run Watershed Landuse

**Town of Culpeper, VA
May 2015**

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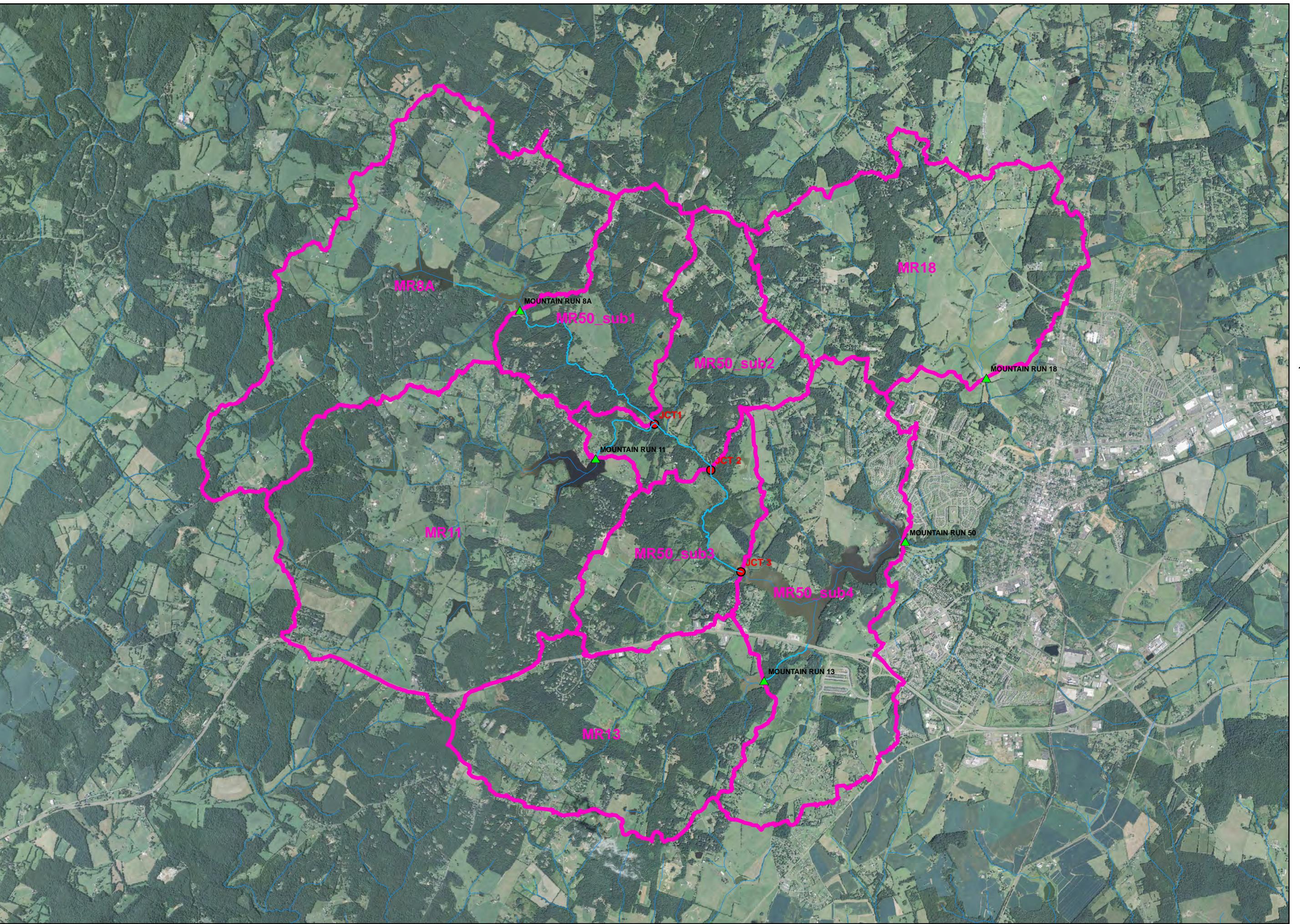
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Mountain Run Watersheds (11x17)

March 31, 2015

1 inch = 4,000 feet



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Structural Data for Mountain Run 11, Mountain Run Lake Planning

	Existing (NAVD88)	As-Built (NGVD29)
Local Name	Mountain Run Lake	
Site Number	11	
Year Completed	1959	
Purpose	Flood Control and Water Supply	
Hazard	High	Low
Drainage Area, mi ²	6.45	5.86
Elevations, ft		
Sediment Pool	422.2	423
Normal Pool & Principal Spillway Crest	433.2	434
Auxiliary Spillway Crest	444.1	445
Top of Dam	450.0	448.5
Dam		
Type	Earthen	
Height, ft	39	
Dam Volume, yds ³	5,700	
Crest Length, ft	750	
Storage Capacity, ac-ft		Original Design Folder
Sediment Storage	120 ¹	80
Water Supply Storage	404 ¹	531
PS Storage (Total Storage to PS crest)	524 ¹	611
ASW Storage (Total Storage to ASW crest)	1739 ²	1,851
Flood Storage (Total Storage between PS and ASW crest)	1203 ²	1,240
Top of Dam Storage	2812 ²	2,469
Principal Spillway		
Type	Concrete	
Riser Height, ft	20	
Conduit Size, in	30	
Capacity, cfs (at Top of Dam)	125	
Energy Dissipater	Plunge Pool	
Auxiliary Spillway		
Type	Earthen	
Width, ft	150	
Capacity, cfs (at Top of Dam)	6,804	

¹ NRCS Sediment Survey September 2014, volume based on 50 yr projected sediment accumulation

² Existing SITES model

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Structural Data for Mountain Run 50, Pelham Lake Planning

	Existing (NAVD88)	As-Built (NGVD29)
Local Name	Pelham Lake	
Site Number	50	
Year Completed	1973	
Purpose	Flood Control and Water Supply	
Hazard	High	High
Drainage Area, mi ²	26.2	23.9
Elevations, ft		
Sediment Pool	380.2	380.9
Normal Pool & Principal Spillway Crest	384.2	384.9
Auxiliary Spillway Crest	390.3	391.2
Top of Dam	402.2	403.1
Dam		
Type	Earthen	
Height, ft	41	
Dam Volume, yds ³	6,880	
Crest Length, ft	850	
Storage Capacity, ac-ft		Original Design Folder
Sediment Storage	223 ¹	942
Water Supply Storage	1486 ¹	1,000
PS Storage (Total Storage to PS crest)	1709 ¹	1,942
ASW Storage (Total Storage to ASW crest)	3612 ²	4,037
Flood Storage (Total Storage between PS and ASW crest)	1887 ²	2,095
Top of Dam Storage	9873 ²	10,000
Principal Spillway		
Type	Concrete	
Riser Height, ft	25	
Conduit Size, in	66	
Capacity, cfs (at Top of Dam)	766	
Energy Dissipater	Impact Basin	
Auxiliary Spillway		
Type	Earthen	
Width, ft	300	
Capacity, cfs (at Top of Dam)	40,013	

¹ NRCS Sediment Survey September 2014, volume based on 50 yr projected sediment accumulation

² Existing SITES model

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NOAA Atlas 14, Volume 2, Version 3
Location name: Culpeper, Virginia, US*
Coordinates: 38.4546, -78.0102
Elevation: 419ft*
* source: Google Maps



POINT PRECIPITATION FREQUENCY ESTIMATES

G.M. Bonnin, D. Martin, B. Lin, T. Parzybok, M. Yekta, and D. Riley

NOAA, National Weather Service, Silver Spring, Maryland

[PF tabular](#) | [PF graphical](#) | [Maps & aerials](#)

PF tabular

Duration	Average recurrence interval(years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.351 (0.317–0.389)	0.420 (0.380–0.465)	0.497 (0.448–0.550)	0.559 (0.503–0.619)	0.634 (0.566–0.698)	0.692 (0.616–0.762)	0.749 (0.663–0.824)	0.805 (0.707–0.886)	0.878 (0.763–0.969)	0.938 (0.808–1.04)
10-min	0.562 (0.507–0.621)	0.673 (0.608–0.744)	0.794 (0.715–0.878)	0.892 (0.802–0.986)	1.01 (0.900–1.11)	1.10 (0.979–1.21)	1.19 (1.05–1.31)	1.27 (1.12–1.40)	1.39 (1.20–1.53)	1.47 (1.27–1.63)
15-min	0.701 (0.633–0.776)	0.844 (0.762–0.933)	1.00 (0.904–1.11)	1.13 (1.01–1.25)	1.28 (1.14–1.41)	1.39 (1.24–1.53)	1.50 (1.33–1.65)	1.60 (1.41–1.76)	1.74 (1.51–1.92)	1.85 (1.59–2.04)
30-min	0.960 (0.866–1.06)	1.17 (1.05–1.29)	1.42 (1.28–1.57)	1.63 (1.47–1.80)	1.88 (1.68–2.08)	2.09 (1.86–2.30)	2.29 (2.03–2.52)	2.49 (2.19–2.74)	2.76 (2.40–3.05)	2.98 (2.57–3.29)
60-min	1.20 (1.08–1.32)	1.46 (1.32–1.61)	1.82 (1.64–2.01)	2.12 (1.91–2.34)	2.50 (2.24–2.76)	2.83 (2.52–3.11)	3.15 (2.79–3.46)	3.49 (3.06–3.84)	3.96 (3.44–4.36)	4.34 (3.74–4.80)
2-hr	1.41 (1.27–1.58)	1.72 (1.54–1.93)	2.16 (1.94–2.42)	2.55 (2.27–2.84)	3.06 (2.71–3.40)	3.48 (3.07–3.88)	3.93 (3.44–4.37)	4.42 (3.84–4.90)	5.10 (4.38–5.67)	5.69 (4.84–6.34)
3-hr	1.54 (1.37–1.74)	1.87 (1.66–2.12)	2.34 (2.08–2.65)	2.76 (2.43–3.11)	3.31 (2.91–3.73)	3.78 (3.30–4.25)	4.27 (3.70–4.80)	4.80 (4.13–5.40)	5.56 (4.73–6.25)	6.21 (5.22–6.99)
6-hr	1.92 (1.71–2.19)	2.32 (2.06–2.65)	2.89 (2.55–3.30)	3.40 (3.00–3.88)	4.11 (3.59–4.67)	4.72 (4.10–5.35)	5.37 (4.62–6.08)	6.08 (5.18–6.88)	7.11 (5.97–8.05)	8.01 (6.64–9.08)
12-hr	2.37 (2.11–2.70)	2.86 (2.54–3.26)	3.58 (3.17–4.07)	4.23 (3.73–4.80)	5.15 (4.51–5.83)	5.97 (5.17–6.74)	6.87 (5.89–7.74)	7.86 (6.66–8.85)	9.34 (7.77–10.5)	10.7 (8.75–12.0)
24-hr	2.76 (2.52–3.06)	3.34 (3.05–3.70)	4.28 (3.90–4.74)	5.09 (4.63–5.62)	6.31 (5.70–6.95)	7.38 (6.62–8.10)	8.58 (7.62–9.39)	9.92 (8.71–10.8)	12.0 (10.3–13.0)	13.7 (11.7–15.0)
2-day	3.22 (2.95–3.55)	3.90 (3.58–4.29)	4.98 (4.56–5.47)	5.88 (5.37–6.46)	7.22 (6.55–7.90)	8.38 (7.54–9.15)	9.65 (8.61–10.5)	11.0 (9.77–12.1)	13.1 (11.5–14.3)	14.9 (12.8–16.3)
3-day	3.43 (3.15–3.77)	4.15 (3.81–4.56)	5.29 (4.85–5.81)	6.25 (5.71–6.85)	7.67 (6.96–8.38)	8.89 (8.01–9.69)	10.2 (9.13–11.1)	11.7 (10.4–12.7)	13.9 (12.1–15.1)	15.7 (13.6–17.2)
4-day	3.64 (3.34–3.99)	4.40 (4.04–4.82)	5.60 (5.13–6.14)	6.62 (6.05–7.24)	8.11 (7.37–8.85)	9.39 (8.48–10.2)	10.8 (9.66–11.8)	12.3 (11.0–13.4)	14.6 (12.8–15.9)	16.6 (14.4–18.1)
7-day	4.23 (3.88–4.64)	5.09 (4.67–5.58)	6.39 (5.86–7.01)	7.50 (6.85–8.21)	9.11 (8.28–9.95)	10.5 (9.47–11.4)	12.0 (10.7–13.0)	13.6 (12.1–14.8)	16.0 (14.0–17.5)	18.0 (15.6–19.7)
10-day	4.81 (4.43–5.24)	5.77 (5.32–6.29)	7.17 (6.60–7.81)	8.32 (7.63–9.06)	9.96 (9.09–10.8)	11.3 (10.3–12.3)	12.8 (11.5–13.9)	14.3 (12.8–15.5)	16.5 (14.7–18.0)	18.4 (16.2–20.0)
20-day	6.41 (5.97–6.89)	7.63 (7.11–8.20)	9.21 (8.58–9.90)	10.5 (9.74–11.2)	12.2 (11.3–13.1)	13.6 (12.5–14.6)	15.0 (13.8–16.1)	16.5 (15.1–17.7)	18.5 (16.8–19.9)	20.1 (18.1–21.7)
30-day	7.84 (7.36–8.37)	9.28 (8.72–9.91)	11.0 (10.3–11.7)	12.4 (11.6–13.2)	14.2 (13.3–15.1)	15.6 (14.5–16.7)	17.1 (15.8–18.2)	18.5 (17.1–19.8)	20.5 (18.8–21.9)	22.0 (20.0–23.5)
45-day	9.82 (9.24–10.4)	11.6 (10.9–12.3)	13.5 (12.7–14.3)	15.0 (14.1–15.9)	16.9 (15.9–17.9)	18.4 (17.2–19.5)	19.8 (18.4–21.0)	21.1 (19.7–22.4)	22.9 (21.2–24.3)	24.2 (22.3–25.8)
60-day	11.6 (11.0–12.2)	13.6 (12.9–14.4)	15.7 (14.8–16.6)	17.3 (16.3–18.2)	19.3 (18.2–20.4)	20.7 (19.5–21.9)	22.2 (20.8–23.4)	23.5 (22.0–24.9)	25.2 (23.5–26.7)	26.4 (24.5–28.1)

¹ Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

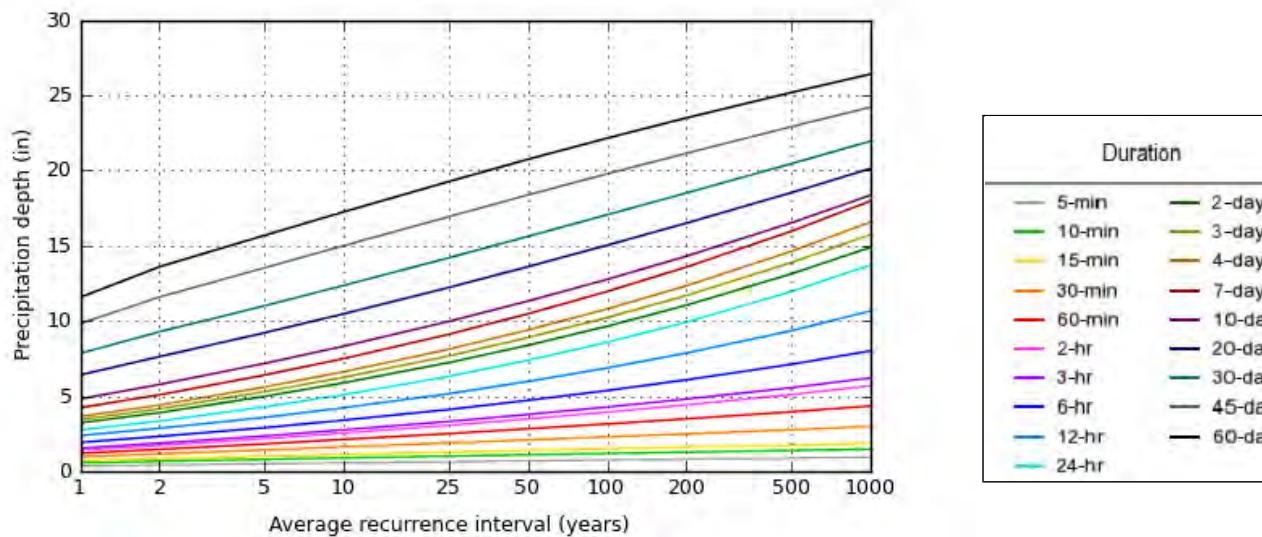
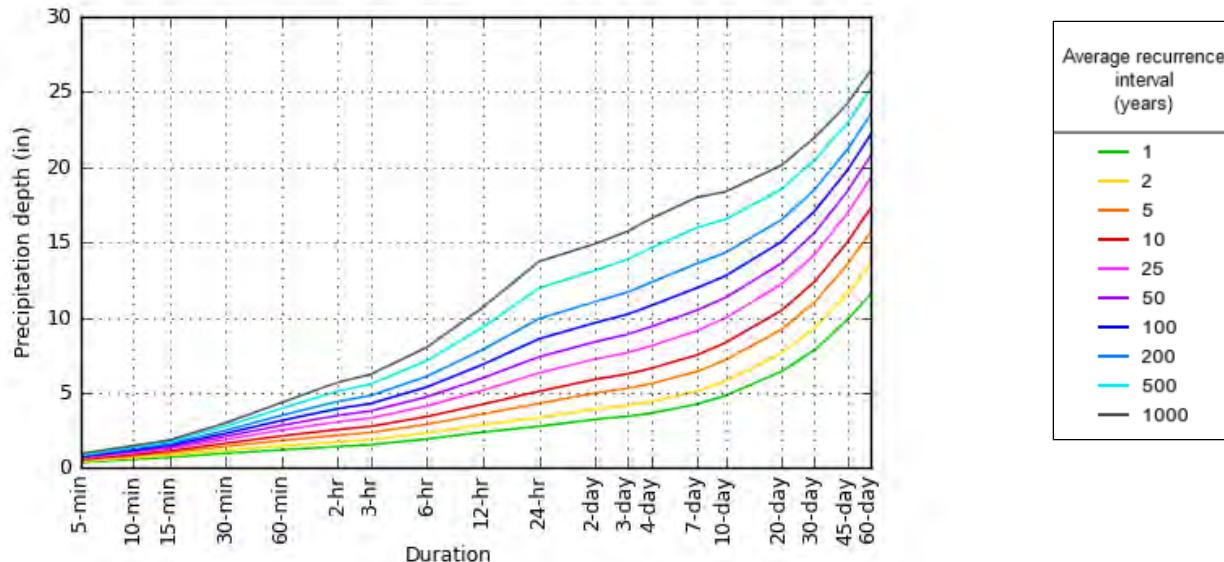
Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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PF graphical

PDS-based depth-duration-frequency (DDF) curves
Coordinates: 38.4546, -78.0102



NOAA/NWS/OHD/HDSC

Created (GMT): Tue Jan 29 17:29:27 2013

[Back to Top](#)**Maps & aerials**

5-Point 24-hr NRCS Dimensionless Rainfall Distribution & TR-60 SDH/FBH Hydrologic Criteria

6-hr P ₁₀₀	5.36 in	Input Rainfall
24-hr P ₁₀₀	8.53 in	
6-hr PMP	28.00 in	
12-hr PMP	33.00 in	
24-hr PMP	36.00 in	
Dam Class	High	

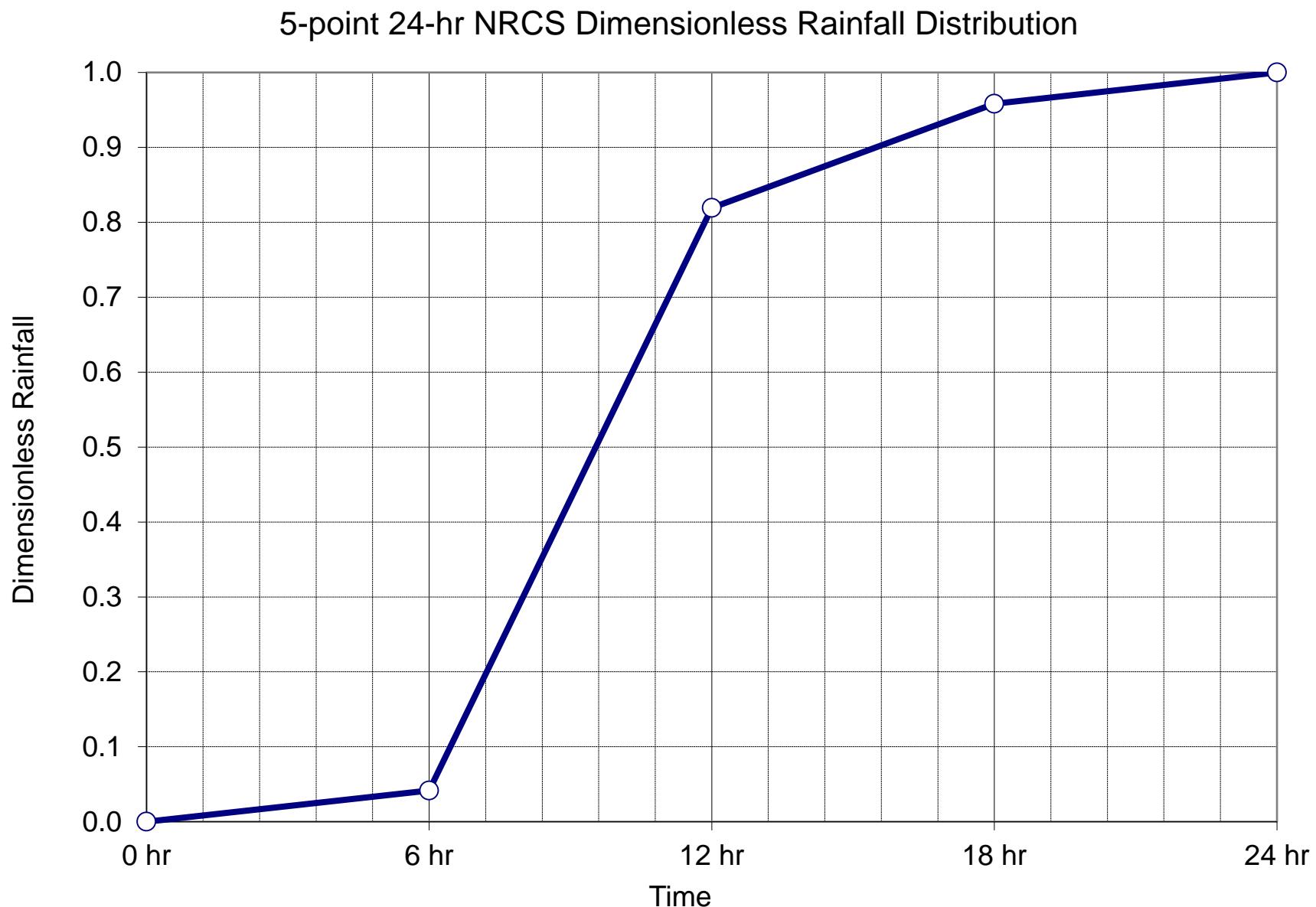
Project Data Project: Mountain Run 50
 County: Culpeper
 State: US
 Designer: K. Ramsey
 Date: May 26, 2015

5-point 24-hr NRCS Dimensionless Rainfall Distribution					
Time	0 hr	6 hr	12 hr	18 hr	24 hr
Dimensionless Rainfall	0.000	0.042	0.819	0.958	1.000

Tbl 2-5 Minimum auxliary spillway hydrologic criteria (TR-60 2nd ed. pg. 2-7)								
Class of Dam	Product of storage x effective height	Existing or planned upstream dams	Auxiliary spillway hydrograph or Stability Design Hydrograph (SDH)			Freeboard Hydrograph (FBH)		
			6-hr SDH	24-hr SDH	6-hr FBH	24-hr FBH		
Low	< 30,000	none	P100	5.36 in	8.53 in	P100 + 0.12(PMP-P100)	8.08 in	11.83 in
	>30,000		P100 + 0.06(PMP-P100)	6.72 in	10.18 in	P100 + 0.26(PMP-P100)	11.25 in	15.67 in
	all	any	P100 + 0.12(PMP-P100)	8.08 in	11.83 in	P100 + 0.40(PMP-P100)	14.42 in	19.52 in
Significant	all	none or any	P100 + 0.12(PMP-P100)	8.08 in	11.83 in	P100 + 0.40(PMP-P100)	14.42 in	19.52 in
High	all	none or any	P100 + 0.26(PMP-P100)	11.25 in	15.67 in	PMP	28.00 in	36.00 in

Purpose: This spreadsheet computes the 5-point 24-hr NRCS dimensionless rainfall distribution for TR60 dams from P₁₀₀ and PMP rainfall depths. The spreadsheet also computes the SDH and FBH rainfall depths for all TR-60 dams.
 User inputs project data and selects dam class from a pull-down list. Yellow-highlighted cells are input values.

Version: 2.2 3/29/2010



Date	1/31/2013	
Prepared By	KAR	
Watershed Dam	Mountain Run No 11	
Description	Auxilliary Spillway Crest Breach	
	Units	
1	Top of Dam Elevation	450.5 Ft msl
2	Breach Hydrograph Elevation	445 Ft msl
3	Wave Berm Elevation	434 Ft msl
4	Principal Spillway Invert	416 Ft msl
5	Stability Berm Elevation	Ft msl
6	Length of Dam at Breach Elev	747 Ft
7	Volume of Breach	1840 Ac Ft
8	Top Width of Dam	20 Ft
9	Upstream Slope Above Berm	2.5 : 1
10	Upstream Slope Below Berm	3 : 1
11	Downstream Slope Above Berm	2.5 : 1
12	Downstream Slope Below Berm	2.5 : 1
13	Wave Berm Width	10 Ft
14	Stability Berm Width	0 Ft

Watershed Dam	Mountain Run No 11	Date	31-Jan-13
	Auxilliary Spillway Crest		
Description	Breach	Prepared By:	KAR
Elevations			
Top of Dam Elevation	450.5 Ft msl	Top Width	20 Ft
Breach Hydrograph Elevation	445.0 Ft msl	Upstream Slope Above Berm	2 1/2 :1
Wave Berm Elevation	434.0 Ft msl	Upstream Slope Below Berm	3 :1
Principal Spillway Invert	416.0 Ft msl	Downstream Slope Above Berm	2 1/2 :1
Stability Berm	0.0 Ft msl	Downstream Slope Below Berm	2 1/2 :1
Length of Dam at Breach Elev	747 Ft	Wave Berm Width	10 Ft
Volume of Breach	1840 Ac Ft	Stability Berm Width	0 Ft
Breach Discharge Computations			

Volume of Breach (Vs)	1,840 Ac Ft
Height Of Breach (Hw)	29 Ft
Cross-Section Area at Breach (A)	3,927 FT ²
T = 65(H ^{0.35})/0.416	508

If L > T,

$$Br = (Vs * Hw) / A \quad 13.59$$

$$Q_{max} = 1,100 (Br)^{1.35} \quad 37,257 \text{ CFS}$$

If L < T,

$$Q_{max} = 0.416 (L)(Hw^{1.5}) \quad 48,530 \text{ CFS}$$

Qmax NOT GREATER THAN

$$Q_{max} = 65(HW^{1.85}) \quad 32,988 \text{ CFS}$$

Qmax NOT LESS THAN

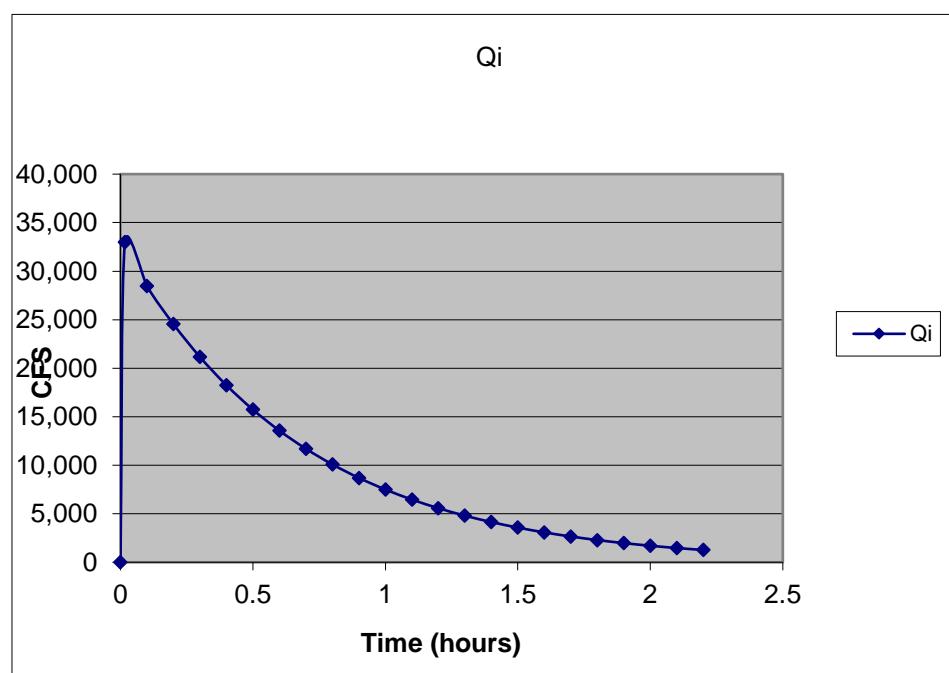
$$Q_{max} = 3.2(Hw^{5/2}) \quad 14,493 \text{ CFS}$$

Breach Qmax for Hazard Classification = 33,000 CFS ←

Mountain Run No 11

Breach Hydrograph

T (min)	T	Q Max		Reservoir Volume at Time of Failure (ac ft)		
		Qi=	33000	Vi=	1840	ft ³
0	0	t	0	Qi	5940000	136.36
1.02	0.017	0.000	33000	11061707.04	253.94	
6	0.1	0.148	28454	9537848.957	218.96	
12	0.2	0.296	24534	8223917.195	188.80	
18	0.3	0.445	21154	7090992.354	162.79	
24	0.4	0.593	18240	6114138.965	140.36	
30	0.5	0.741	15727	5271856.662	121.03	
36	0.6	0.889	13561	4545606.965	104.35	
42	0.7	1.038	11693	3919405.251	89.98	
48	0.8	1.186	10082	3279468.933	77.58	
54	0.9	1.334	8693	2913914.111	66.89	
60	1	1.482	7495	2512494.009	57.68	
66	1.1	1.630	6463	2166373.443	49.73	
72	1.2	1.779	5573	1867934.362	42.88	
78	1.3	1.927	4805	1610608.177	36.97	
84	1.4	2.075	4143	1388731.185	31.88	1780.19
90	1.5	2.223	3572	1197419.913	27.49	
96	1.6	2.372	3080	1032463.636	23.70	
102	1.7	2.520	2656	890231.6954	20.44	
108	1.8	2.668	2290	767593.5927	17.62	
114	1.9	2.816	1974	661850.0853	15.19	
120	2	2.964	1702	570673.7779	13.10	
126	2.1	3.113	1468	492057.8965	11.30	
132	2.2	3.261	1266	424272.1198	9.74	
138	2.3	3.409	1091	365824.4954	8.40	
144	2.4	3.557	941	315428.6015	7.24	
150	2.5	3.706	811	271975.2338	6.24	
156	2.6	3.854	700	234507.9914	5.38	
162	2.7	4.002	603	202202.2273	4.64	
168	2.8	4.150	520	174346.8975	4.00	
174	2.9	4.298	448	150328.9111	3.45	
180	3	4.447	387	129619.6367	2.98	
186	3.1	4.595	333	111763.267	2.57	
192	3.2	4.743	287	96366.78639	2.21	
198	3.3	4.891	248	83091.32124	1.91	
204	3.4	5.040	184	71644.68095	1.64	1969.44
210	3.5	5.188	159	61774.92706	1.42	
216	3.6	5.336	137	53264.82807	1.22	
222	3.7	5.484	118	45927.07826	1.05	
228	3.8	5.632	102	39600.17508	0.91	
234	3.9	5.781	88	34144.86455	0.78	
240	4	5.929	76	29441.07628	0.68	
246	4.1	6.077	65	25385.28075	0.58	
252	4.2	6.225	56	21888.21062	0.50	
258	4.3	6.374	49	18872.89603	0.43	
264	4.4	6.522	42	16272.97044	0.37	
270	4.5	6.670	36	14031.20997	0.32	
276	4.6	6.818	31	12098.27389	0.28	1841.63
282	4.7	6.966				

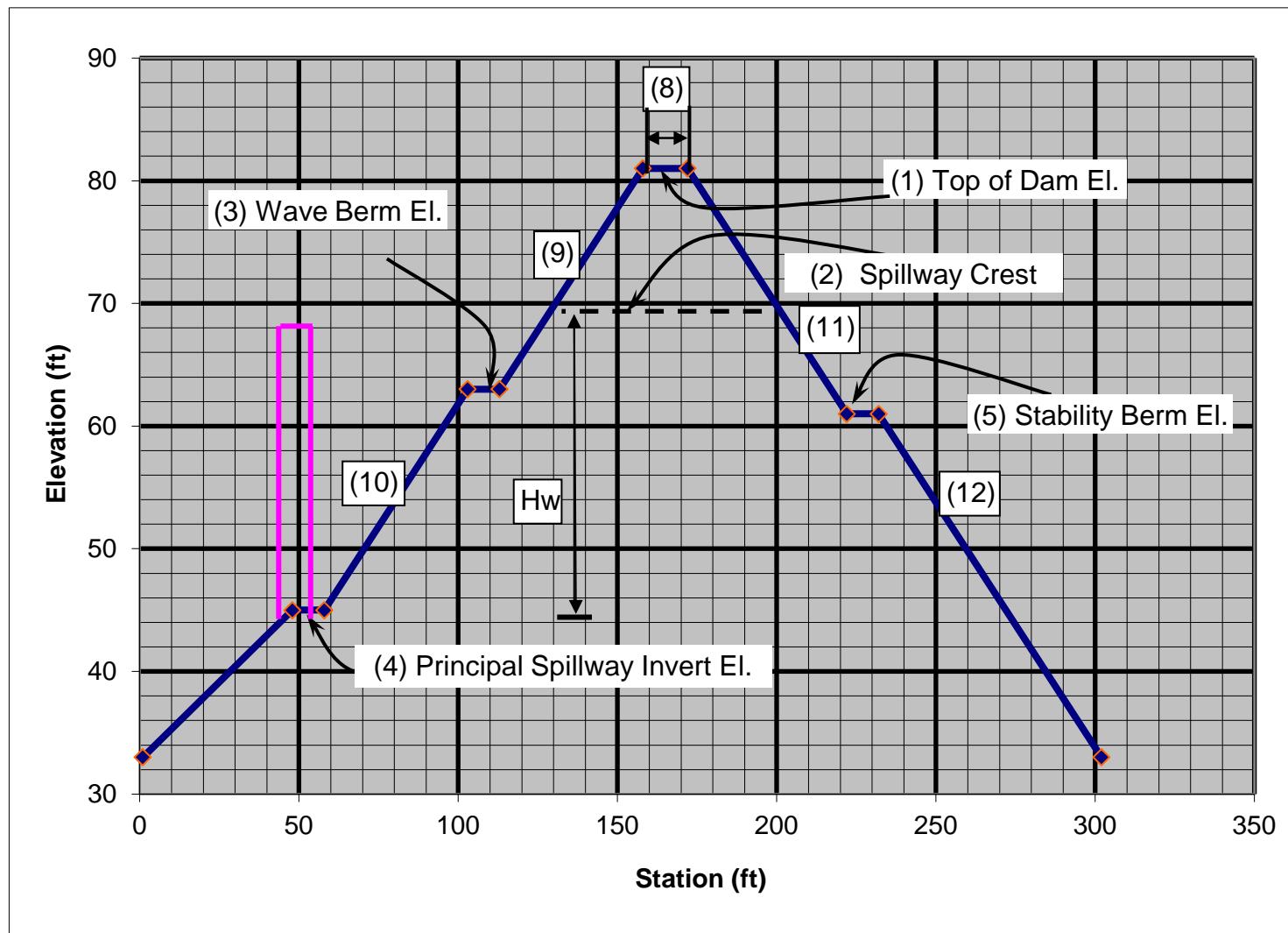


Input Form

- 1 Top of Dam Elevation
- 2 Breach Hydrograph Elevation
- 3 Wave Berm Elevation
- 4 Principal Spillway Invert Elevation
- 5 Stability Berm Elevation
- 6 Length of Dam
- 7 Volume of Breach
- 8 Top Width of Dam
- 9 Upstream Slope Above Wave Berm
- 10 Upstream Slope Below Wave Berm
- 11 Downstream Slope Above Stability Berm
- 12 Downstream Slope Below Stability Berm
- 13 Wave Berm Width
- 14 Stability Berm Width

Description

- Top of Settled Dam Elevation
 Auxilliary Spillway Crest Elevation
 Wave Berm Elevation
 Invert of the Riser Floor
 Stability Berm Elevation
 Length of Dam at Auxilliary Spillway
 Crest Elevation
 Reservoir Storage at Auxilliary Spillway
 Crest
 Width of Dam
 Rise (ft): Run (1 foot)
 Width of Wave Berm
 Width of Stability Berm



Appendix B

Sediment Survey Reports

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Storage Capacity Below PSW Crest

Mountain Run 11, Mountain Run Lake and Mountain Run 50, Lake Pelham

Prepared by: Mathew Lyons, SCE

Date: May 21, 2015

Sediment surveys were completed by NRCS staff for Mountain Run 11, Mountain Run Lake (MR11) and Mountain Run 50, Lake Pelham (MR50) in September 2014.

The results of the survey for MR11 show that there is insufficient storage capacity below the crest of the PSW to store 50 years of anticipated sediment accumulation and the originally planned volume of water supply.

The results of the survey for MR50 show that there is more than sufficient storage capacity below the crest of the PSW to store 50 years of anticipated sediment accumulation and the originally planned volume of water supply.

The pool volume discussed below accounts for the sediment storage and water supply storage volumes.

MR50 was originally designed with 1,000 ac-ft of water supply storage. MR11 was originally designed with 530.7 ac-ft of water supply storage.

MR50 currently has a pool volume of 1,709 ac-ft. The anticipated sediment accumulation over the next 53 years (50 yr minimum storage + 3 years to construction) is 223 ac-ft. The minimum total pool volume required is 1,223 ac-ft so this structure exceeds the 50 yr minimum required capacity.

MR11 currently has a pool volume of 524 ac-ft. The anticipated sediment accumulation over the next 54 years (50 yr minimum storage + 4 years to construction) is 120 ac-ft. The minimum total pool volume required is 650.7 ac-ft. In order to meet the 50 yr minimum required capacity for sediment storage, an additional 126.7 ac-ft of storage capacity will be required.

Based on discussions with the Town of Culpeper, the storage capacity required for MR11 can be recalculated to account for the 50 yr minimum required capacity for sediment storage and a reduced volume of water supply storage. The water supply storage can be added to the storage capacity for MR50. There will be no net loss of water storage for the Town because the structures are both utilized for the water supply.

MR11 does not have adequate capacity for the required 50 year sediment storage (120 ac-ft) and the design water supply volume (530.7 ac-ft). The current total available storage at MR11 is 524 ac-ft. The current required storage capacity is 650.7 ac-ft. If we account for the required 50 year sediment storage (120 ac-ft) then we can only account for 404 ac-ft of water supply volume. This leaves 126.7 ac-ft of water supply that will need to be added to MR50.

MR50 has sufficient capacity for the required 50 year sediment storage and the original design water supply volume plus there is excess storage capacity that can be counted as water supply. 126.7 ac-ft of water supply can be added to this structure. Even with the 126.7 ac-ft of additional water supply volume added, there is 359.3 ac-ft of capacity in excess of the 50 year minimum required sediment storage volume. This excess capacity will be converted into additional water supply.

The revised storage capacities for sediment storage and water supply for MR11 and MR50 are shown in the table below. The sediment storage volumes are based on the anticipated sediment accumulation over the next 50 years.

Storage Capacity (ac-ft) Below PSW Crest

Structure	50 year Sediment Storage Volume	Water Supply Volume	Total Volume
MR11	120	404	524
MR50	223	1,486	1,709

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Natural Resources Conservation Service
1550 Earl Core Road, Suite 200
Morgantown, WV 26505
(304) 284-7540 (Phone)
(304) 284-4839 (Fax)

SUBJECT: ENG - Geology
Mountain Run Site No. 11
Sediment Survey 9/2014

DATE: 4/17/2015

TO: Mat Lyons
State Conservation Engineer
Richmond, VA

FROM: Jeff McClure, Geologist

Purpose: On September 9, 2014, a sediment survey of Mountain Run Site 11 was conducted as part of the planning effort for the rehabilitation of the structure. The Mountain Run Site No. 11 is located in Culpeper County, Virginia. During the rehabilitation planning process, it is necessary to determine that the sediment pool of the structure has adequate room for sediment storage for at least fifty years after the rehabilitation is complete.

Structure Background: Mountain Run Watershed Site No. 11 was completed in 1958. The original design defined the drainage area as 3,750 acres. The sediment pool for Mountain Run River Site 11 was designed to hold 80.0 acre-feet of submerged sediment. In addition, Mountain Run Watershed Site No. 11 has 530.7 acre-feet of municipal water storage. The surface area of the sediment and water supply pool was designed to be 75.2 acres. It is owned and operated by the City of Culpeper, VA.

The only documentation of the designed sediment pool for Mountain Run Site 11 is on Sheet 1 of the As-built drawings which lists the sediment pool as 80 acre-feet. I was unable to locate a form SCS-309 filled out for Mountain Run Site 11. However, Form SCS-34 for the 1980 sediment survey conducted by the USDA/SCS states that the sediment pool is 115.76 acre feet and the total pool is 646.46 acre-feet.

Previous sediment surveys:

In May 1971, the first sediment survey was completed on the structure. At that time according to the Form SCS-34 completed at the time, there had been 10.59 acre feet deposited since storage began, which the report put at July 1959. This doesn't agree with the date on the as-built drawings which is July 1958. This form puts the annual sediment deposition rate at 0.9 acre-feet per year.

In October 1980, USDA/SCS completed another sediment survey of the Mountain Run 11 pool. At that time, the report says the as-builds were in error and the total pool volume was 646.46 acre-feet and the resultant sediment pool was 115.76. They determined that from July 1959 until October 1980, 59.57 acre-feet of sediment had been deposited. They calculated the



sedimentation rate for the intervening 21.2 years to be 2.59 acre-feet per year. Below is an excerpt from the conclusions section of their report.

“During the first period of 11.83 years, 10.59 acre feet of sediment was accumulated. This is an average sediment accumulation of 0.895 acre feet per year. During the period May, 1971 to October 22, 1980, there was 48.98 acre feet of sediment accumulated. This was 5.2 acre feet of sediment per year.

No explanation can be offered for this discrepancy.”

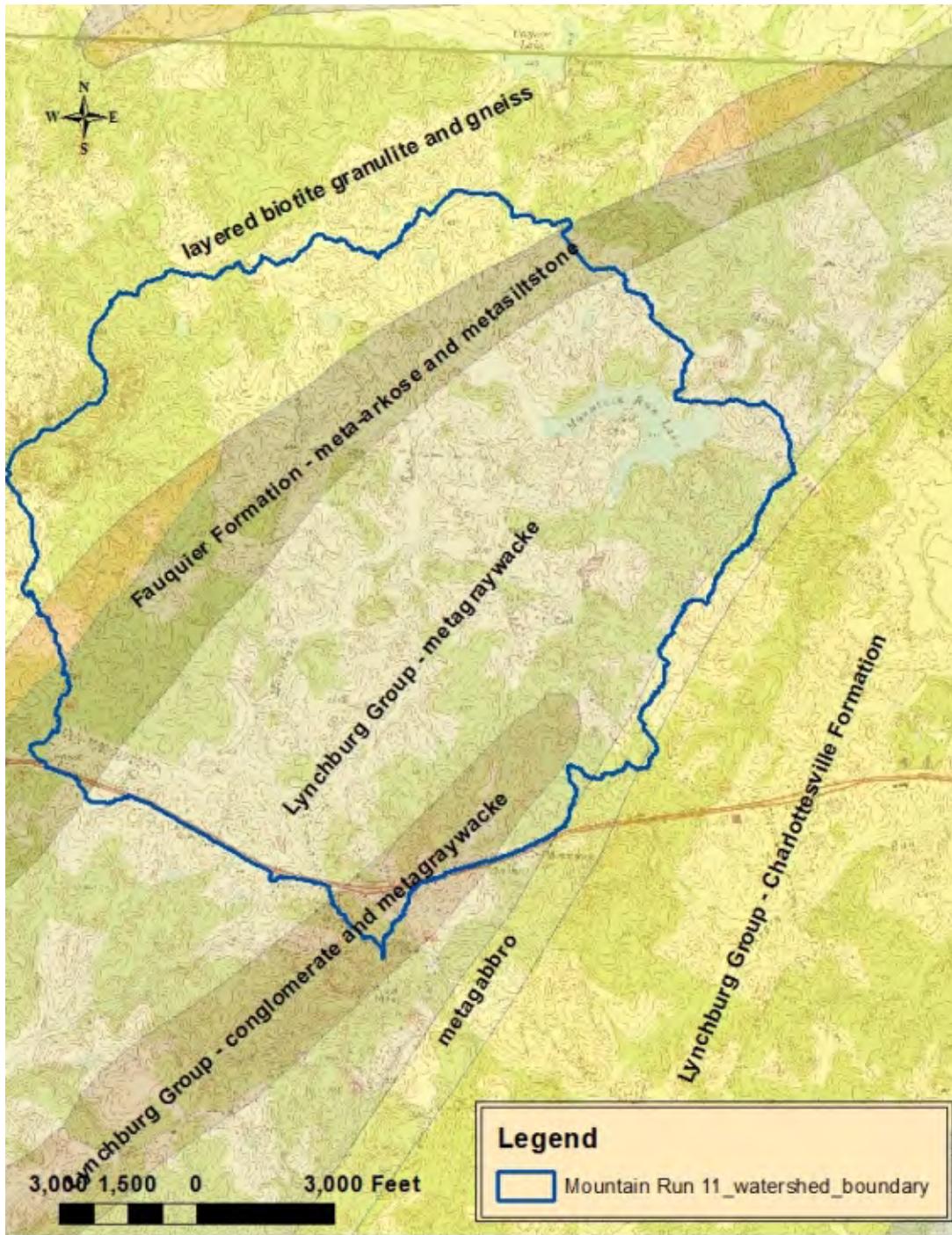
The mistake they made in the comparison was not going back and recalculating the sedimentation rate for the first 11.8 years based on the total pool size of 646.46 acre-feet. Had they done that, they would have calculated that 46.35 acre-feet of sediment accumulated in the first 11.8 years for a sediment accumulation rate of 3.92 acre-feet of sediment per year. Then for the period of May 1971 to October 1980, an additional 13.22 acre-feet of sediment accumulated for a sedimentation rate of 1.4 acre-feet of sediment per year. The overall sediment accumulation from July 1959 to October 1980 was 59.57 acre-feet, for an overall sedimentation rate of 2.80 acre-feet per year.

In June 1987 Draper Aden Associates completed a sediment survey of Mountain Run 11 under contract for the Town of Culpeper, Virginia. They determined the total existing pool to be 588 acre-feet. Therefore, from October 1980 to June 1987, there was -1.11 acre-feet of sediment deposited, or in other words, there was a net loss of accumulated sediment in the Mountain Run 11 pool. Draper Aden Associates did note negative sedimentation rate and did in fact do additional surveying to verify that their sediment volume was correct. They also project the life of the sediment pool to be 54 years. 54 years from July 1959 would be July 2013.

In March 2003, Alpine Ocean Seismic Survey, Inc. completed a sediment survey of Mountain Run 11 under contract for the Town of Culpeper, Virginia. They determined the total existing pool to be 598.7 acre-feet. Therefore it could be deductively reasoned that from June 1987 to March 2003 there was a net loss of sediment previously accumulated in the pool of 10.7 acre-feet. Alpine Ocean Seismic Survey, Inc.’s report did not attempt to explain the negative sediment accumulation trend.

Factors affecting sedimentation rate:

The digital representation of the 1993 Geologic Map of Virginia shows that the entire watershed draining into Mountain Run Site No. 11 is underlain rocks of the late and middle Proterozoic. The formation with the largest areal extent is the Lynchburg Group - metagraywacke (see Figure 1). That same map shows the embankment itself to be underlain by the same formation. However, in the original Geology Report, the material under the embankment is described as soft to hard schist, and a firm black shale under the right abutment.



**Figure 1. Mountain Run Site 11
watershed geology map**

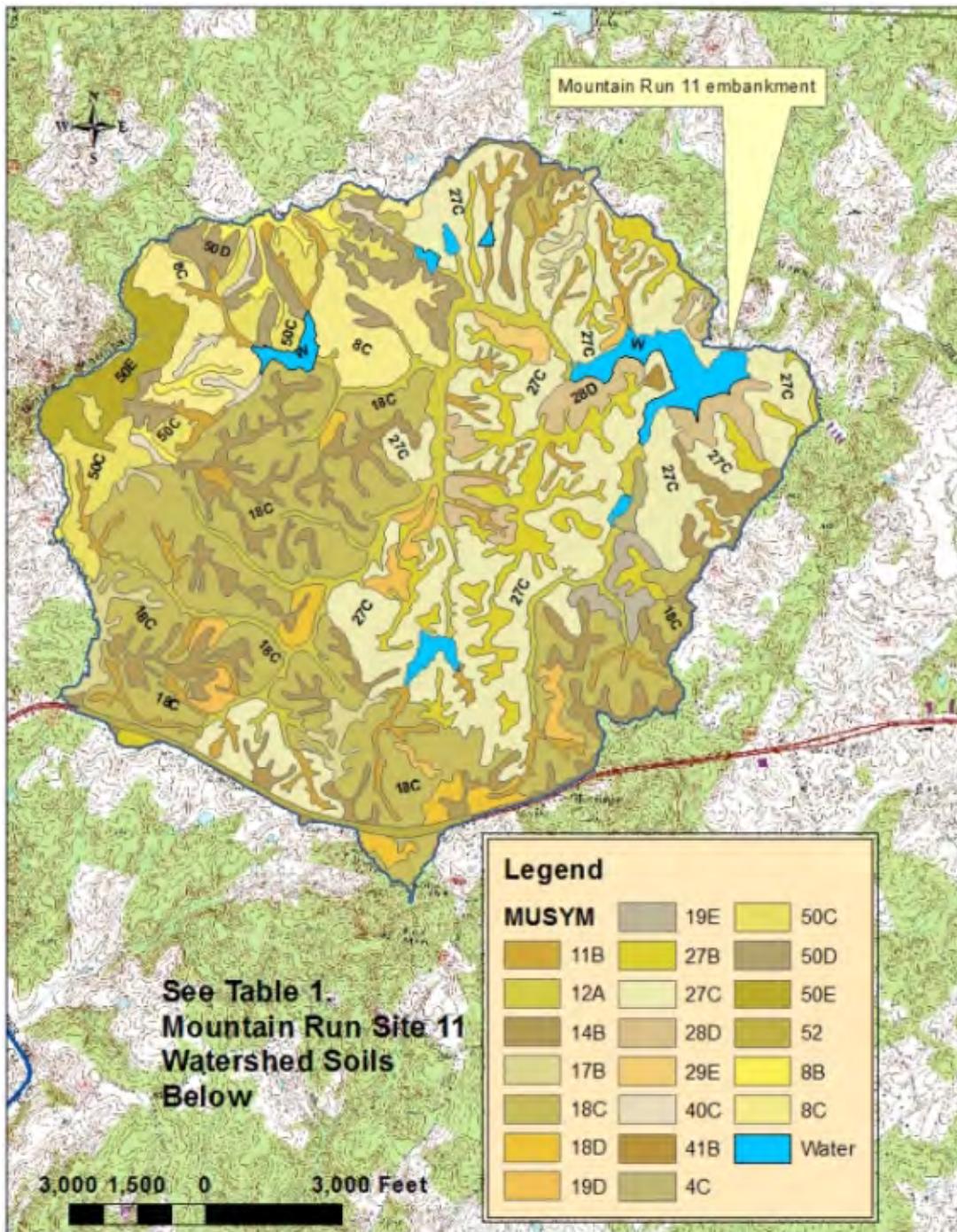
Page 4

Mountain Run Site No. 11

Sediment Survey September 2014

April 17, 2015

The major soils in the watershed are Edgemont-Culpeper complex, and Glenelg silt loam, (<http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm>). See Figure 2 below. The Edgemont-Culpeper complex covers 23.5% of the watershed with 967.9 acres. Glenelg silt loam soils cover 1,229.1 acres or 30.0% of the watershed; Culpeper sandy loam covers 337.6 acres or 8.2%; Clifford loam covers 223.2 acres or 5.4%; and Codorus and Meadowville soils cover 217.3 acres or 5.3%. Looking at the Table 1, Map Unit Legend, 68.7% of the soils in the watershed are on slopes greater than 7%. It should be noted that the Glenelg silt loam soils are under the embankment footprint.



**Figure 2. Mountain Run Site 11
watershed soils map**

<u>Map Unit</u>	<u>Map Unit Name</u>	<u>Acres in Watershed</u>	<u>Percent of Watershed</u>
4C	Cardova-Edgemont complex, 7 to 15 percent slopes	10.8	0.3
8B	Clifford loam, 2 to 7 percent slopes	60.9	1.5
8C	Clifford loam, 7 to 15 percent slopes	223.2	5.4
11B	Codorus and Meadowville soils, 2 to 7 percent slopes, occasionally flooded	217.3	5.3
12A	Codorus silt loam, 0 to 2 percent slopes, occasionally flooded	195.4	4.7
14B	Culpeper sandy loam, 2 to 7 percent slopes	337.6	8.2
17B	Edgemont sandy loam, 2 to 7 percent slopes	70.5	1.7
18C	Edgemont-Culpeper complex, 7 to 15 percent slopes	908	22.0
18D	Edgemont-Culpeper complex, 15 to 25 percent slopes	59.9	1.5
19D	Edgemont-Rixeyville complex, 15 to 25 percent slopes, very rocky	74.1	1.8
19E	Edgemont-Rixeyville complex, 25 to 45 percent slopes, very rocky	37.9	0.9
27B	Glenelg silt loam, 2 to 7 percent slopes	258.4	6.3
27C	Glenelg silt loam, 7 to 15 percent slopes	970.7	23.5
28D	Glenelg-Rixeyville complex, 15 to 25 percent slopes	121.5	2.9
29E	Glenelg-Griffinsburg complex, 25 to 45 percent slopes	17.7	0.4
40C	Meadowville loam, 7 to 15 percent slopes	26.5	0.6
41B	Minnieville loam, 2 to 7 percent slopes	3.8	0.1
50C	Rhodhiss-Mine Run complex, 7 to 15 percent slopes	158	3.8
50D	Rhodhiss-Mine Run complex, 15 to 25 percent slopes	131	3.2
50E	Rhodhiss-Mine Run complex, 25 to 45 percent slopes	97.5	2.4
52	Udorthents, smoothed-Urban land, 0 to 7 percent slopes	32.6	0.8
W	Water	114.4	2.8
Totals for Watershed		4127.7	100

Table 1. Mountain Run Site 11 Watershed Soils (see in Figure 2 on page 3).

Areas upstream of Mountain Run 11 that are controlled by a structure/dam would also decrease the amount of sediment normally expected to wash into Mountain Run 11. There are two fairly large structures upstream of Mountain Run 11. One in the northern part of the watershed has a drainage area of 492 acres and one in the southern part of the watershed has a drainage area of 323 acres. The structure in the northern part of the watershed is in the NID database and is identified in that database as the Lakeview Estates Dam. There are three drainage areas on the northern border of the watershed that flow through three different ponds. The sum of those three drainage areas is just under 200 acres. Also, two of those ponds have ponds in series upstream of them. See Figure 5. The trap efficiency of all these structures is unknown, but 1,015 acres of the Mountain Run 11 watershed (25%) flows through another impounding structure before reaching the Mountain Run 11 pool.

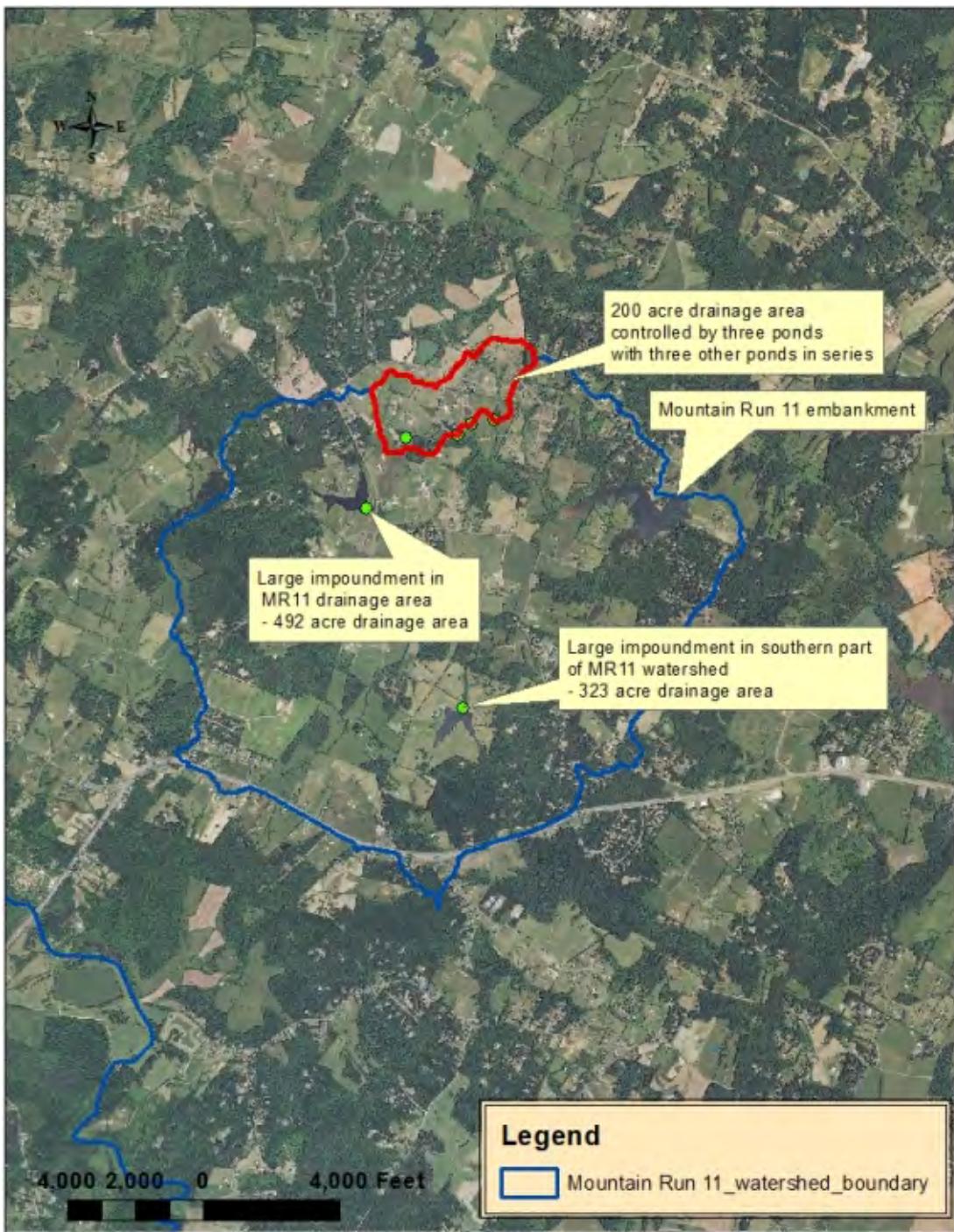


Figure 3. Mountain Run Site 11 watershed map

Land uses in a watershed have a large influence on the amount of erosion. The National Land Cover Dataset (2011) shows 1,228 acres of Deciduous Forest (29.8% of the watershed); Evergreen Forest 188.5 acres (4.6%); Mixed Forest 330.3 acres ((8.0%); Developed Open Space 409.9 acres (9.9%); Open Water 127.4 acres (3.1%); Hay/Pasture 1,739.5 acres (42.2%) and 0.0 acres of Cultivated Crops. Form SCS-347 from the original hydrology calculations for Mountain Run 50 appears to have been completed for the entire Mountain Run watershed (17,189 acres) in June 1969. The sum of the as-built drainage areas for the five Mountain Run structures is 17,850 acres. Looking at that Form SCS-347, the percentage of the watershed in ‘woods’ was 37.6%. The percentage in Hay or Pasture was 47.5%. and the percentage in crops was 7.0%. ‘Towns’ was 3.0% of the study area. Comparing the two sets of percentages of land use, it appears that several changes have occurred that would decrease the sediment load to the reservoir, Woods/Forest has increased, and Cultivated Crops have decreased to zero. The sum of the Hay/Pasture land use categories have decreased in the watershed which may increase the sediment load to the reservoir. Part of the decrease in Hay/Pasture may be accounted for in the increase of Town/Developed from 1969 to 2011. Established Town/Developed is not necessarily a large contributor of sediment. However, during the transition from e.g. Hay/Pasture to Town/Developed, the construction phase, there could be large inputs of sediment to the reservoir, depending on erosion and sediment controls.

Population growth/development in a watershed can affect sediment loads in a watershed. Judging from the population growth in Culpeper County from the 2000 census to the 2010 census, 34,262 (12,871 housing units) to 46,689 (17,657 housing units), it can be assumed there was a large amount of construction in the county during that decade. Some of that construction may have occurred in the Mountain Run 11 watershed. During that decade, the population grew 36.2% (1,247 people per year). It should be noted that outside the City of Culpeper, the population only increased in that decade from 24,598 to 30,310, a 23.2% increase. So far this decade, estimates have the population of Culpeper County increasing by 504 from 2010 to 2011, 478 from 2011 to 2012 and 717 from 2012 to 2013. The rate of increase is slightly lower than the previous decade, but still substantial.

Process:

On September 9, 2014, the actual sediment survey was done. J. McClure (USDA-NRCS-WV, Geologist), G. Wright (USDA-NRCS-VA, Engineer), R. Evans (USDA-NRCS-VA, Civil Engineering Technician), Barry Mason (USDA-NRCS-VA, Soil Conservation Technician (WAE)), and John Morgan (town of Culpeper, Virginia, Operations Supervisor) conducted the survey. A Garmin GPSMAP 541s mounted on the back of a boat provided and operated by the City of Culpeper was used to take GPS referenced sonar readings of the top of sediment (see Figure 3). The sediment survey was completed in one day. At the conclusion of the sediment survey, 1,648 sets of data points had been collected with the Garmin 541s (see Figure 4).

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Figure 4: Sediment survey team taking a reading.



Figure 5. Map of Mountain Run Site 11 with sediment survey points shown.

R. Evans, Civil Engineering Technician was able to contour the top of sediment using most of the 1,648 data points collected. Some points appeared to be erroneous and were eliminated from the final dataset. In the two upper ends of the lake were areas that were too shallow for the boat to go. In those areas, Ms. Evans projected the elevation of the top of sediment from survey points to the water's edge (which had a known and constant elevation).

Findings:

Ms. Evans calculated that the volume of the Mountain Run 11 pool on September 9, 2014 was 524 acre-feet. The as-built for Mountain Run 11 calls for 530.7 acre-feet of municipal water storage. Therefore currently, the lake has zero acre-feet of sediment pool remaining and the water storage pool has been decreased by 6.7 acre feet. Depending on which starting point is used, the sedimentation rate ranges from 1.76 acre-feet per year to 2.22 acre-feet per year.

Sediment Survey	Year	Lake Storage Volume (acre-feet)
Original Storage	1958.583	646.46
"Date Storage Began" according to Form SCS-34	1959.583	646.46
USDA SCS	1971.417	600.11
USDA SCS	1980.833	586.4
Draper Aden	1987.5	588
Alpine Ocean Seismic Survey	2003	598.7
USDA NRCS	2014.667	524

Deposition rate 1959 to 2014 (AcreFeet/Year)	2.22
Deposition rate 1971 to 2014 (AcreFeet/Year)	1.76
Deposition rate 1980 to 2014 (AcreFeet/Year)	1.84
Deposition rate 1987 to 2014 (AcreFeet/Year)	2.36

Table 2. Sediment Survey Results Summary

Discussion:

Mountain Run 11 was designed and subsequently built to have a normal pool that held 610.7 acre-feet of water, 80 acre-feet of that was sediment pool. The As-Built pool was not actually surveyed after construction. In May of 1971, the Soil Conservation Service (predecessor of NRCS) (SCS) conducted a sediment survey of Mountain Run 11 and determined that the remaining normal pool volume was 600.11 acre-feet. In October 1980, a sediment survey done by the Soil Conservation Service determined forensically that the as-built pool was actually 646.6 acre-feet. Therefore, the As-Built pool had 530.7 acre-feet of water supply and 115.76 acre-feet of sediment storage. The 1980 SCS sediment survey also determined that the remaining normal pool volume was 586.4 acre-feet. The 1971 and 1980 sediment surveys

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provide very good starting points to compare with the normal pool as of September 2014. Using the 1971 normal pool volume of 600.11 acre-feet and the 2014 normal pool volume of 524 acre-feet, a sediment deposition rate of 1.76 acre-feet per year was calculated. Using the 1980 normal pool volume of 586.4 acre-feet and the 2014 normal pool volume of 524 acre-feet, a sediment deposition rate of 1.82 acre-feet per year was calculated. The two rates are only 0.08 acre-feet per year different (less than 5 percent). In calculating the future sediment deposition rate, I used the 1.76 acre-feet per year because it was averaged over a longer period of time.

The County of Culpeper is projecting most of its growth to be north of the City of Culpeper, not west of the city. For that reason, the existing land uses in the area controlled by Mountain Run 11 should remain about what they are now for the life of the project. That being said, using the actual changes in the Mountain Run 11 normal pool due to sedimentation over the last 43 years (SCS sediment survey in 1971 to NRCS/City of Culpeper sediment survey in 2014) gives a very good estimate of future sedimentation rates. The alternative would be to categorize the land uses of the area controlled by Mountain Run 11 and then assign theoretical erosion rates to those areas. The actual measurements provide the basis for a better estimate.

Conclusion:

The pool of Mountain Run 11 currently has a volume of 524 acre feet (September 2014). To provide the volume for the original as-built municipal water storage (530.7 acre-feet) and the required 50 years of sediment pool life plus 4 years to account for construction lag (120.05 acre-feet), 126.75 acre-feet (204,491 cubic yards) of sediment would need to be removed from the pool. Another solution would be to raise the permanent pool by approximately two feet to add the required volume. A third option would be to re-allocate the pool to 120.05 acre-feet of sediment pool and 403.95 acre-feet of municipal water storage.

Jeff McClure, Geologist



Date: 4/17/2015

Concurred



Mathew Lyons, PE
State Conservation Engineer

Date: 4/20/15

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Mountain Run Site No. 11
Sediment Survey September 2014
April 17, 2015

References:

- <http://soils.usda.gov/survey/geography/ssurgo/>
- National Land Cover Database, 2006.
- Digital Representation of the 1993 Geologic Map of Virginia, Publication 174, 2003, Commonwealth of Virginia, Department of Mines, Minerals, and Energy, Division of Mineral Resources.

Copies: Matt Pyle, Project Engineer
Alica, Ketchem, Planning/Environmental Engineer

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Natural Resources Conservation Service
1550 Earl Core Road, Suite 200
Morgantown, WV 26505
(304) 284-7540 (Phone)
(304) 284-4839 (Fax)

SUBJECT: ENG - Geology
Mountain Run Site No. 50
Sediment Survey 9/2014

DATE: 4/17/2015

TO: Mat Lyons
State Conservation Engineer
Richmond, VA

FROM: Jeff McClure, Geologist

Purpose: On September 10, 2014, a sediment survey of Mountain Run Site 50 was conducted as part of the planning effort for the rehabilitation of the structure. The Mountain Run Site No. 50 is located in Culpeper County, Virginia. During the rehabilitation planning process, it is necessary to determine that the sediment pool of the structure has adequate room for sediment storage for at least fifty years after the rehabilitation is complete.

Structure Background: Mountain Run Watershed Site No. 50 was completed in 1970. The original design defined the drainage area as 6,285 acres. Current mapping methods put that drainage area at 6,773.892 acres. The sediment pool for Mountain Run River Site 50 was designed to hold 877 acre-feet of submerged sediment. In addition, Mountain Run Watershed Site No. 50 has 1,000 acre-feet of municipal water storage. The design life of the sediment pool is 100 years. The surface area of the sediment and water supply pool was designed to be 254 acres. It is owned and operated by the City of Culpeper, VA.

Previous sediment surveys:

In April 1987 Draper Aden Associates completed the first sediment survey of Mountain Run 50 under contract for the Town of Culpeper, Virginia. They determined the total existing pool to be 1,824 acre-feet. According to their report, from July 1970 to April 1987, there were 118 acre-feet of sediment deposited. They projected the life of the sediment pool to be 116.5 years. They also made the statement "This pool life, at current deposition rates, is far greater than the 50 years normally included in an SCS design. . ." They put the sedimentation rate at 8.07 acre-feet per year. However, in Table 5 of their report, they list "Full Pool Storage" for Lake Pelham (Mountain Run 50) as 1,942 acre-feet. That 1,942 acre-feet from the original hydrology calculations includes 65 acre-feet of aerated sediment which would be deposited above the "Full pool"/normal pool elevation. This would change their number of 118 acre-feet of sediment (submerged) to 53 acre-feet. The Draper Aden report also mentions the fact that the as-built pool may have actually been 85 acre-feet larger than designed because borrow for the embankment was taken from the pool. Increasing the size of the as-built pool by 85 acre-feet increases it to 1,962 acre-feet. That raises the sedimentation rate back over 8 acre-feet per year (8.2 acre-feet per year).



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Mountain Run Site No. 50
Sediment Survey September 2014
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In March 2003, Alpine Ocean Seismic Survey, Inc. completed a sediment survey of Mountain Run 50 under contract for the Town of Culpeper, Virginia. They determined the total existing pool to be 2004.7 acre-feet. Therefore it could be deductively reasoned that from April 1987 to March 2003 there was a net loss of sediment previously accumulated in the pool of 180.7 acre-feet. Alpine Ocean Seismic Survey, Inc.'s report did not attempt to explain the negative sediment accumulation trend. This set of sediment survey data was not used to project the life of the sediment pool for Mountain Run 50.

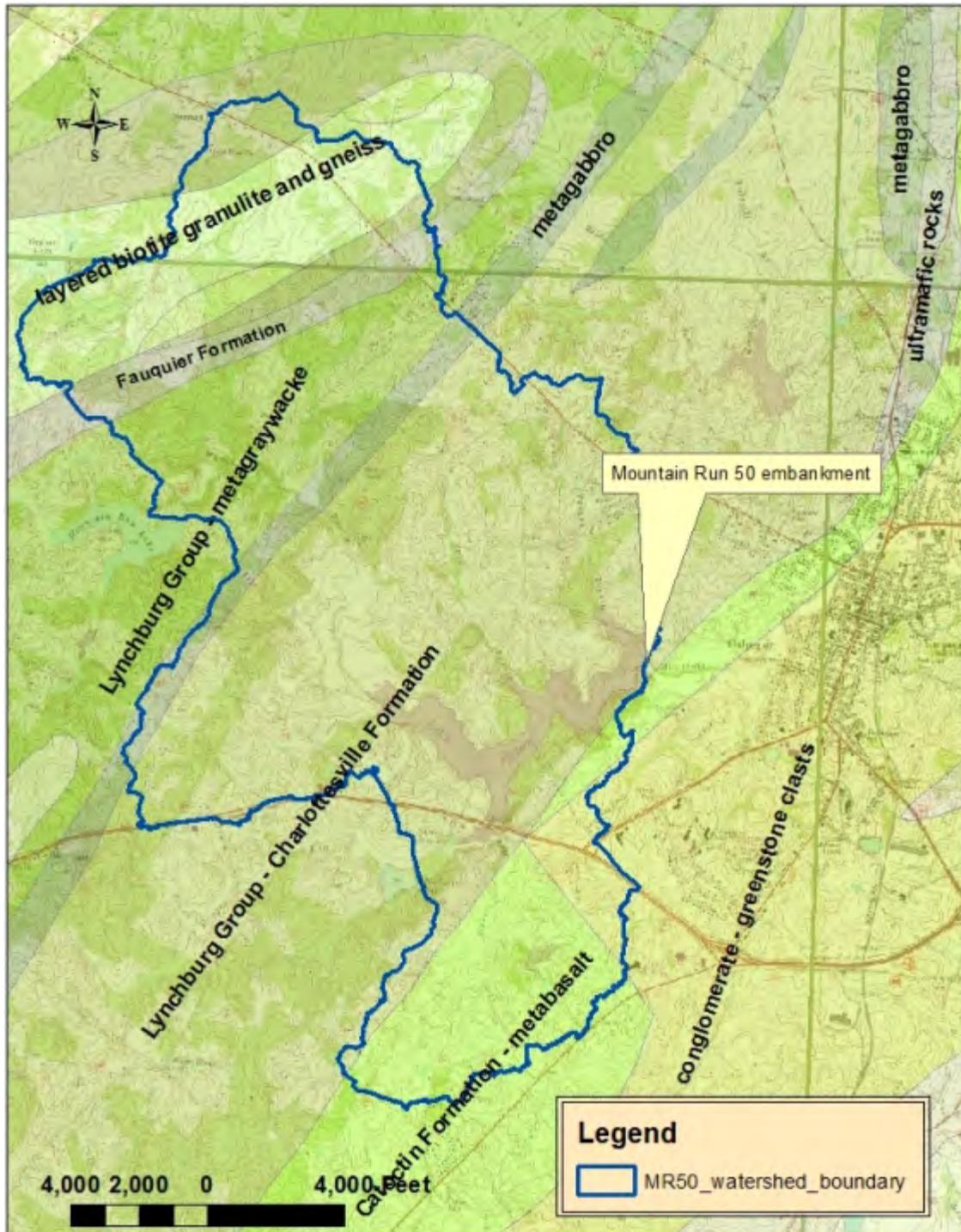
In August 2005 Alpine Ocean Seismic Survey, Inc. completed a supplemental sediment survey. Only part of Pelham Lake (Mountain Run 50) was surveyed. Apparently, there had been complaints about the lake being muddy as a result of a construction project under development south and east of the lake (see Figure 1). The survey led to the conclusion that the most significant sedimentation observed was located adjacent to the south side of the Route 29 Bridge. The "sedimentation composed of silts and sands, which have formed a deltaic area adjacent to the mouth of a stream that is being fed by a small stream. This area is about 200 feet long and 200 feet wide." Based on this supplemental sediment survey, the City of Culpeper required the contractor to remove sediment from the Mountain Run 50 pool (see below).



Figure 1. Upper end of Mountain Run Site 50 impoundment showing Three Flags Development and sediment cleanout area.

Factors affecting sedimentation rate:

The digital representation of the 1993 Geologic Map of Virginia shows that the sub-watershed controlled by Mountain Run Site No. 50 is underlain rocks of the Cambrian Period and the late Proterozoic. The formation with the largest areal extent in the sub-watershed is the Lynchburg Group – Charlottesville Formation (see Figure 2). That same map shows the embankment itself to be underlain by the same formation. However, in the original Geology Report, and in the as-built drawings, the drill holes along the centerline of the embankment all encountered greenstone, which is probably the Catoctin greenstone. Berquist et al (1993) do not describe any greenstone members of the Charlottesville Formation. Therefore, it appears that the Geologic Map of Virginia (1993) has the boundary between the Catoctin greenstone and the Lynchburg Group – Charlottesville Formation a little too far to the east in the area of Mountain Run 50.



**Figure 2. Mountain Run Site 50
watershed geology map**

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Mountain Run Site No. 50

Sediment Survey September 2014

April 17, 2015

The major soils in the watershed are the Edgemont-Culpeper complex, and the Culpeper sandy loam, (<http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm>). See Figure 3 below. The Edgemont-Culpeper complex covers 24.2% of the watershed with 1,637.6 acres. Edgemont-Rixeyville complex covers 759.1 acres or 11.2% of the watershed; Culpeper sandy loam soils cover 730.0 acres or 10.8%; Faquier silt loam covers 645.1 acres or 9.5%; Codorus and Meadowville soils cover 652.2 acres or 9.2%; Glenelg silt loam covers 589.5 acres or 8.7%; and Rhodhiss-Mine Run complex covers 523.3 acres or 7.7%. Looking at the Table 1, Map Unit Legend, 66.4% of the soils in the watershed are on slopes greater than 7%.

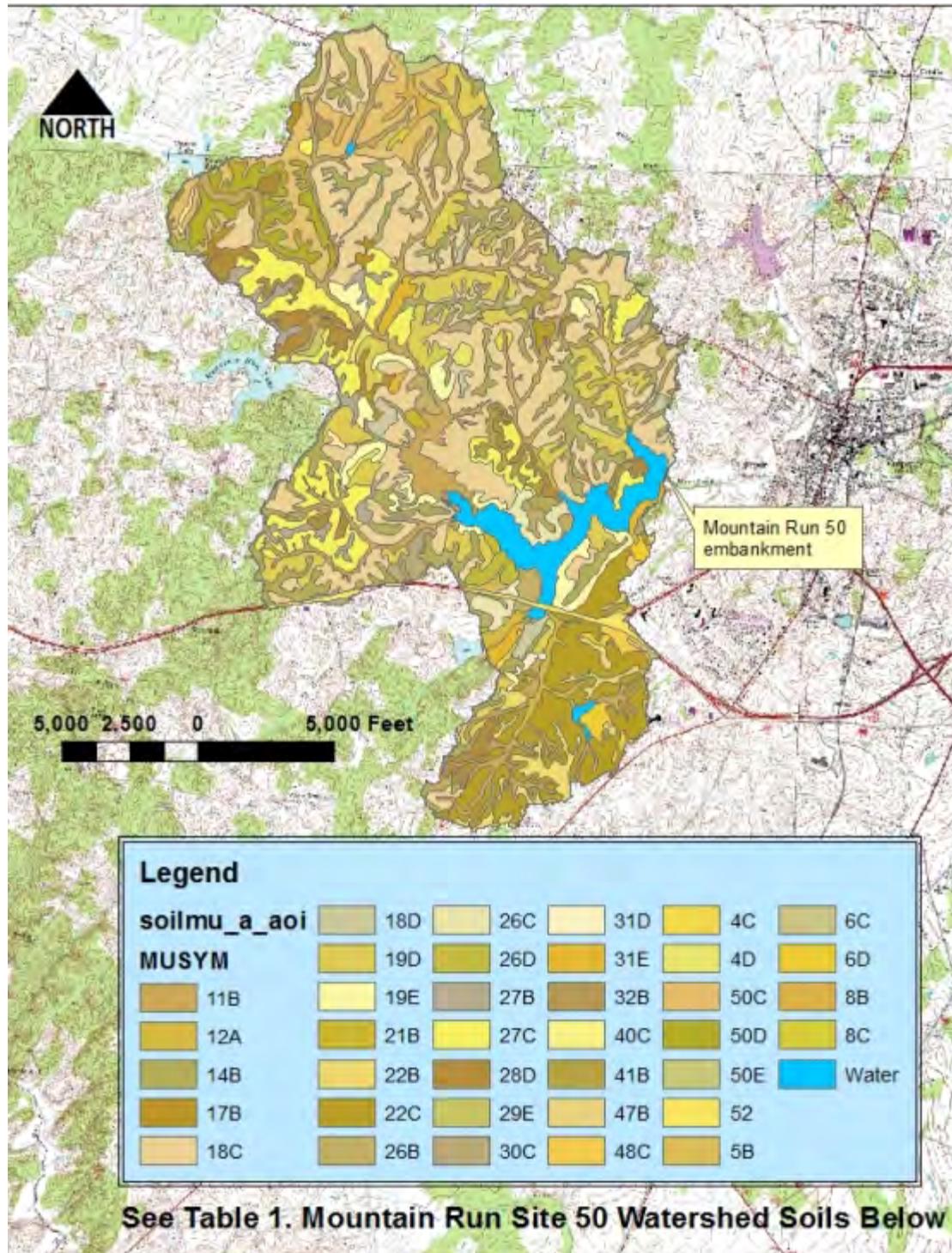


Figure 3. Mountain Run Site 50 watershed soils map

Map Unit Legend

Mountain Run Site 50 Watershed Soils

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
4C	Cardova-Edgemont complex, 7 to 15 percent slopes	12.1	0.2%
4D	Cardova-Edgemont complex, 15 to 25 percent slopes	18.8	0.3%
5B	Catoctin-Fletcherville complex, 2 to 7 percent slopes	10.1	0.1%
6C	Catoctin-Alanthus complex, 7 to 15 percent slopes	0.0	0.0%
6D	Catoctin-Alanthus complex, 15 to 25 percent slopes	47.7	0.7%
8B	Clifford loam, 2 to 7 percent slopes	33.4	0.5%
8C	Clifford loam, 7 to 15 percent slopes	6.0	0.1%
11B	Codorus and Meadowville soils, 2 to 7 percent slopes, occasionally flooded	625.2	9.2%
12A	Codorus silt loam, 0 to 2 percent slopes, occasionally flooded	101.4	1.5%
14B	Culpeper sandy loam, 2 to 7 percent slopes	730.0	10.8%
17B	Edgemont sandy loam, 2 to 7 percent slopes	56.0	0.8%
18C	Edgemont-Culpeper complex, 7 to 15 percent slopes	1,577.7	23.3%
18D	Edgemont-Culpeper complex, 15 to 25 percent slopes	59.9	0.9%
19D	Edgemont-Rixeyville complex, 15 to 25 percent slopes, very rocky	557.5	8.2%
19E	Edgemont-Rixeyville complex, 25 to 45 percent slopes, very rocky	201.6	3.0%
21B	Elsinboro-Delanco complex, 2 to 7 percent slopes, rarely flooded	15.4	0.2%
22B	Fauquier silt loam, 2 to 7 percent slopes	133.7	2.0%
22C	Fauquier silt loam, 7 to 15 percent slopes	511.4	7.5%
26B	Germanna silt loam, 2 to 7 percent slopes	81.7	1.2%
26C	Germanna silt loam, 7 to 15 percent slopes	76.4	1.1%
26D	Germanna silt loam, 15 to 25 percent slopes	31.5	0.5%
27B	Glenelg silt loam, 2 to 7 percent slopes	116.9	1.7%

27C	Glenelg silt loam, 7 to 15 percent slopes	472.6	7.0%
28D	Glenelg-Rixeyville complex, 15 to 25 percent slopes	217.4	3.2%
29E	Glenelg-Griffinsburg complex, 25 to 45 percent slopes	10.7	0.2%
30C	Griffinsburg-Edgemont complex, 7 to 15 percent slopes	51.5	0.8%
31D	Griffinsburg-Edgemont complex, 15 to 25 percent slopes, very rocky	8.0	0.1%
31E	Griffinsburg-Edgemont complex, 25 to 45 percent slopes, very rocky	65.2	1.0%
32B	Halifax gravelly fine sandy loam, 2 to 7 percent slopes	9.4	0.1%
40C	Meadowville loam, 7 to 15 percent slopes	6.6	0.1%
41B	Minnieville loam, 2 to 7 percent slopes	57.7	0.9%
47B	Rapidan silty clay loam, 2 to 7 percent slopes	4.0	0.1%
48C	Rapidan-Penn complex, 7 to 15 percent slopes, rocky	23.0	0.3%
50C	Rhodhiss-Mine Run complex, 7 to 15 percent slopes	353.5	5.2%
50D	Rhodhiss-Mine Run complex, 15 to 25 percent slopes	169.8	2.5%
50E	Rhodhiss-Mine Run complex, 25 to 45 percent slopes	13.5	0.2%
52	Udorthents, smoothed-Urban land, 0 to 7 percent slopes	49.1	0.7%
W	Water	258.2	3.8%
Totals for Area of Interest		6,774.5	100.0%

Table 1. Map Unit Legend for soils in Figure 2 on page 3

The drainage area for which the Mountain Run 50 sediment pool was designed is 6,773.892 acres. Within that area, there are two impoundments that were not considered in the original sediment delivery calculations. Those two impoundments are also not on the NID database. The sum of the drainage areas for those two impoundments is 622 acres (See Figure 4). The trap efficiency of those two ponds is unknown, but 622 acres of the Mountain Run 50 watershed (10%) flows through another impounding structure before reaching the Mountain Run 50 pool. Those two structures should decrease the amount of sediment normally expected to wash into Mountain Run 50. Two things should be noted. First, Sheet 3 of the As-Builts shows the original Center Line of the Mountain Run 50 embankment approximately 150 feet downstream of where the embankment was actually built. The first sheet of the As-Builts for mountain Run 50 list the drainage area as 6,685 acres. Form SCS-523 in the Hydraulics folder also lists the drainage area 6,285 acres. It is unknown if that number matches the current embankment location or the original design location. Second, current mapping techniques put the Mountain Run 50 drainage area at 6,773.892 acres. (7.7% larger than the watershed for which the structure was designed).

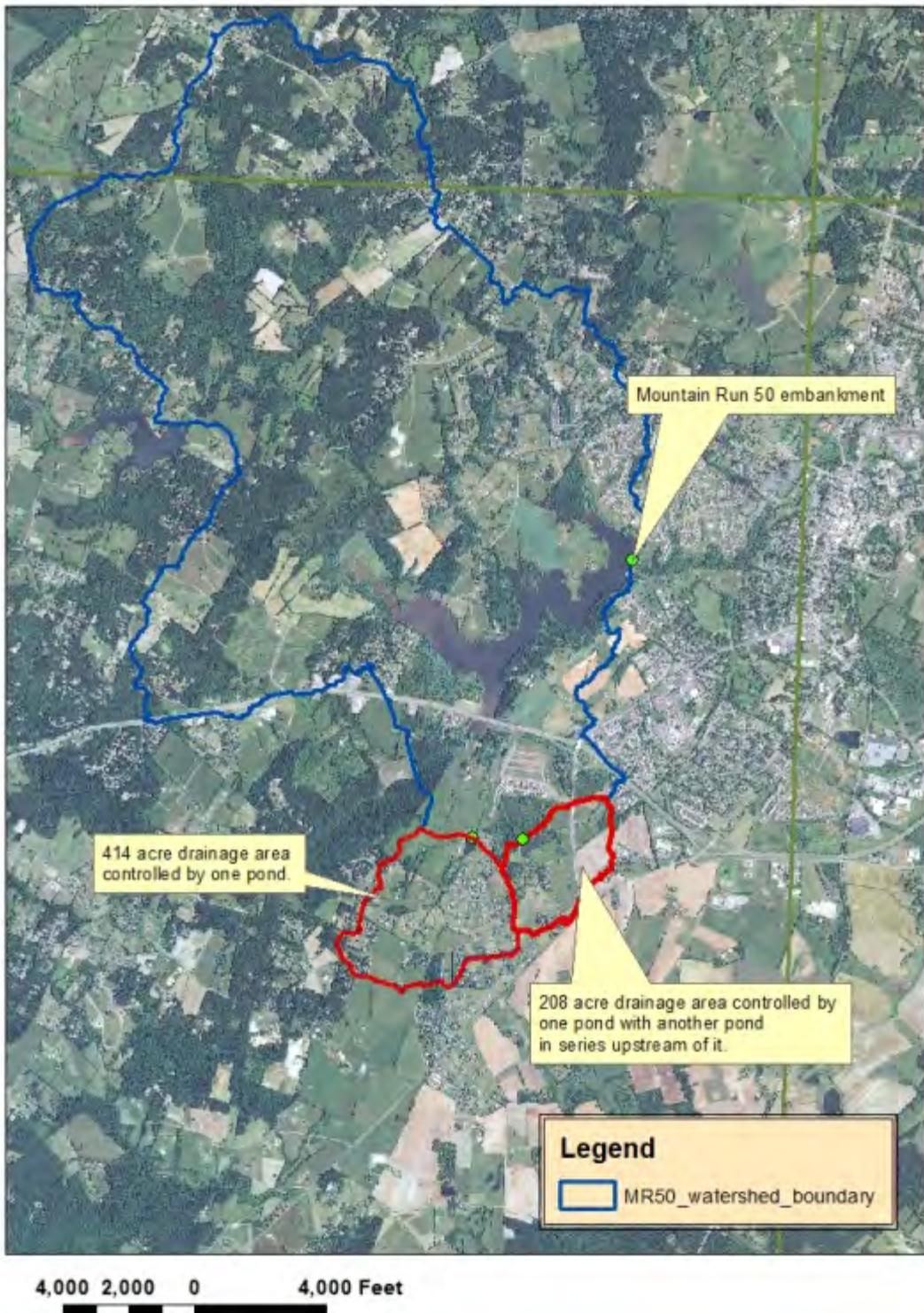


Figure 4. Mountain Run Site 50 watershed map

Land uses in a watershed have a large influence on the amount of erosion. The National Land Cover Dataset (2011) shows 1,594.9 acres of Deciduous Forest (23.5% of the watershed); Evergreen Forest 322.4 acres (4.8%); Mixed Forest 511.6 acres ((7.6%); Developed Open Space 1,193.8 acres (17.6%); Open Water 297.9 acres (4.4%); Hay/Pasture 2,528.1 acres (37.3%) and 31.9 acres of Cultivated Crops (0.5%). Form SCS-347 from the original hydrology calculations for Mountain Run 50 appears to have been completed for the entire Mountain Run watershed (17,189 acres) in June 1969. The sum of the as-built drainage areas for the five Mountain Run structures is 17,850 acres. Looking at that Form SCS-347, the percentage of the watershed in ‘woods’ was 37.6%. The percentage in Hay or Pasture was 47.5%. and the percentage in crops was 7.0%. ‘Towns’ was 3.0% of the study area. Comparing the two sets of percentages of land use, it appears that several changes have occurred that would decrease the sediment load to the reservoir, Cultivated Crops have decreased to one half of one percent. The sum of the Hay/Pasture land use categories have decreased in the watershed which may increase the sediment load to the reservoir. Part of the decrease in Hay/Pasture may be accounted for in the increase of Town/Developed from 1969 to 2011. Established Town/Developed is not necessarily a large contributor of sediment. However, during the transition from e.g. Hay/Pasture to Town/Developed, the construction phase, there could be large inputs of sediment to the reservoir, depending on erosion and sediment controls.

Population growth/development in a watershed can affect sediment loads in a watershed. Judging from the population growth in Culpeper County from the 2000 census to the 2010 census, 34,262 (12,871 housing units) to 46,689 (17,657 housing units), it can be assumed there was a large amount of construction in the county during that decade. Some of that construction may have occurred in the Mountain Run 50 watershed. During that decade, the population grew 36.2% (1,247 people per year). It should be noted that outside the City of Culpeper, the population only increased in that decade from 24,598 to 30,310, a 23.2% increase. So far this decade, estimates have the population of Culpeper County increasing by 504 from 2010 to 2011, 478 from 2011 to 2012 and 717 from 2012 to 2013. The rate of increase is slightly lower than the previous decade, but still substantial.

As noted earlier, sometime between the March 2003 and the August 2005 sediment surveys done by Alpine Ocean Seismic Survey, Inc., Mountain Run must have experienced what appeared to be a large influx of sediment from the Three Flags Development just south of Route 29. It appears the City of Culpeper and the Three Flags Development reached an understanding whereby the developers agreed that 1,300 cubic yards of unconsolidated sediments may have been deposited in Mountain Run 50 as a result of the Three Flags Development operations. To mitigate for that possible damage, the developers agreed to remove 2,600 cubic yards of sediment from the Mountain Run 50 pool. That operation was completed sometime after October 2009.

Process:

On September 10, 2014, the actual field work for the sediment survey was completed. J. McClure (USDA-NRCS-WV, Geologist), G. Wright (USDA-NRCS-VA, Engineer), R. Evans

(USDA-NRCS-VA, Civil Engineering Technician), Barry Mason (USDA-NRCS-VA, Soil Conservation Technician (WAE)), and John Morgan (town of Culpeper, Virginia, Operations Supervisor) conducted the survey. A Garmin GPSMAP 541s mounted on the back of a boat provided and operated by the City of Culpeper was used to take GPS referenced sonar readings of the top of sediment (see Figure 3). The sediment survey was completed in one day. At the conclusion of the sediment survey, 2,033 sets of data points had been collected with the Garmin 541s (see Figure 5).



Figure 5: Sediment survey team taking a reading.



Figure 6. Map of Mountain Run Site 50 with sediment survey points shown.

R. Evans, Civil Engineering Technician was able to contour the top of sediment using most of the 2,033 data points collected. Some points appeared to be erroneous and were eliminated from the final dataset. In the three upper ends of the lake were areas that were too shallow for the boat to go. In those areas, Ms. Evans projected the elevation of the top of sediment from survey points to the water's edge (which had a known and constant elevation).

Findings:

The sediment survey completed by Draper Aden Associates in 1987 appears to be technically sound. Using Draper Aden's figures and the pool volume of 1,877 acre-feet plus 85 acre-feet for borrow (1,962 acre-feet) as the starting point, the sedimentation rate for the first 16.83 years of the impoundment's design life was 8.2 acre-feet of submerged sediment per year. The results of the sediment survey performed by Alpine Ocean Seismic Survey, Inc. in 2003 do not appear to be technically sound. Those results were not used to formulate any conclusions about the Mountain Run 50 sediment pool. The sediment survey performed on September 10, 2014 by NRCS and City of Culpeper personnel also appears to be technically sound. Ms. Evans calculated that the volume of the Mountain Run 50 pool on September 10, 2014 was 1,709 acre-feet. Using that volume and Draper Aden's volume of 1,824, the sedimentation rate for the period beginning in April 1987 and ending in September 2014 was 4.2 acre-feet of submerged sediment per year.

Sediment Survey	Year	Lake Storage Volume (acre-feet)
Original Storage	1970.5	1877
As-built Storage plus 85 acre-feet of borrow	1970.5	1,962
Draper Aden	1987.33	1824
Alpine Ocean Seismic Survey, Inc.	2003	2004.7
USDA NRCS	2014.667	1709

	Sedimentation rate	Expected sediment in 50 yr life post rehab (plus construction lag)
Deposition rate 1970 to 1987 (ACFT/YR)	3.149138443	166.90
Deposition rate 1970 (+85 ac-ft) to 1987 (ACFT/YR)	8.199643494	434.58
Deposition rate 1970 to 2014 (ACFT/YR)	3.803744877	201.60
Deposition rate 1970 (+85 ac-ft) to 2014 (ACFT/YR)	5.728258655	303.60
Deposition rate 1987 to 2014 (ACFT/YR)	4.206752753	223.0

Table 2. Sediment Survey Results Summary

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Mountain Run Site No. 50
Sediment Survey September 2014
April 17, 2015

The County of Culpeper is projecting most of its growth to be north of the City of Culpeper, not west of the city. For that reason, the existing land uses in the area controlled by Mountain Run 50 should remain about what they are now. That being said, using the actual changes in the Mountain Run 50 normal pool due to sedimentation over the last 27 years (Draper Aden sediment survey in 1987 to NRCS/City of Culpeper sediment survey in 2014) gives a very good estimate of future sedimentation rates. The alternative would be to categorize the land uses of the area controlled by Mountain Run 50 and then assign theoretical erosion rates to those areas. The actual measurements provide the basis for a better estimate.

Conclusion:

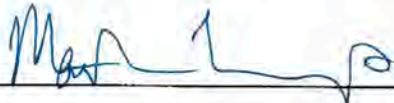
The pool of Mountain Run 50 had a volume of 1,709 acre feet on September 10, 2014. 1,000 acre-feet of that are dedicated for City of Culpeper municipal water supply. Going forward using the sedimentation rate of 4.2 acre-feet per year, the Mountain Run 50 sediment pool has 169 years left before it is filled in with sediment. A 53 year sediment pool (allowing 3 years for construction lag) would only require 223 acre-feet. That leaves an excess of 486 acre-feet in the normal pool of Mountain Run 50 if the design life for this rehabilitation project is fifty years.

Jeff McClure, Geologist



Date: 4/17/2015

Concurred



Mathew Lyons, PE
State Conservation Engineer

Date: 4/20/15

References:

- <http://soils.usda.gov/survey/geography/ssurgo/>
- National Land Cover Database, 2006.
- Digital Representation of the 1993 Geologic Map of Virginia, Publication 174, 2003, Commonwealth of Virginia, Department of Mines, Minerals, and Energy, Division of Mineral Resources.

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Alica, Ketcham, Planning/Environmental Engineer

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Appendix C

SITES Model Output

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	MR50PSHRain	MR50PSHRun	MR50FBH24	MR50FBH6
Site Identification	50	50	50	50
Watershed Runoff Curve Number	69.	100.	69.	69.
Total Watershed Drainage Area (Sq.Miles)	26.16	26.16	26.16	26.16
Watershed Time of Concentration (Hours)	1.90	1.90	1.90	1.90
SDH Rainfall Total (Inches)	N/A	N/A	N/A	N/A
SDH Rainfall Duration (Hours)	N/A	N/A	N/A	N/A
FBH or Storm Rainfall Total (Inches)	N/A	N/A	36.00	28.00
FBH or Storm Rainfall Duration (Hours)	N/A	N/A	24.0	6.0
SDH Inflow Peak (CFS)	N/A	N/A	N/A	N/A
FBH or Storm Inflow Peak (CFS)	N/A	N/A	64257.5	62872.3
Initial Reservoir Elevation (Feet)	385.18	385.18	385.18	385.18
Maximum WS SDH (Feet)	N/A	N/A	N/A	N/A
Maximum WS FBH or Storm (Feet)	N/A	N/A	404.57	403.90
Storage at Max. WS FBH or Storm (Acre-Ft)	N/A	N/A	11591.9	11106.1
Top Dam (Feet)	N/A	N/A	N/A	N/A
Storage, Top Dam (Acre-Ft)	N/A	N/A	N/A	N/A
Emb. Yardage (CY)	N/A	N/A	N/A	N/A
PSH Drawdown (Days)	5.79	9.28	N/A	N/A
378 Drawdown (Days)	N/A	N/A	N/A	N/A
PS Crest (Feet)	384.10	384.10	384.10	384.10
PS Number of Conduits	1	1	1	1
PS Conduit Diameter (Inches)	66.0	66.0	66.0	66.0
PS Conduit Height (Feet)	N/A	N/A	N/A	N/A
PS Conduit Width (Feet)	N/A	N/A	N/A	N/A
PS Conduit Area (Sq. Feet)	23.76	23.76	23.76	23.76
Storage, PS Crest (Acre-Ft)	1730.	1730.	1730.	1730.
PS Discharge at AS Crest (CFS)	679.0	636.9	644.4	644.4
PS Discharge for SDH (CFS)	N/A	N/A	N/A	N/A
PS Discharge FBH or Storm (CFS)	N/A	N/A	788.0	781.9
AS Crest (Feet)	393.48	389.64	390.30	390.30
Storage, AS Crest (Acre-Ft)	4962.3	3407.8	3652.4	3652.4
AS Width (Feet)	N/A	N/A	300.	300.
AS Exit Slope (%)	N/A	N/A	3.85	3.85
AS Ret. Curve Index	N/A	N/A	0.03	0.03
AS Veg. Cover Factor	N/A	N/A	0.87	0.87
AS Maintenance Code	N/A	N/A	2	2
AS Max. Head SDH (Feet)	N/A	N/A	N/A	N/A
AS Peak Discharge SDH/Storm (CFS)	N/A	N/A	52813.6	48957.9
AS Exit Velocity SDH or Storm (Ft/S)	N/A	N/A	29.62	28.79
AS Stress SDH or Storm (Lb./Sq.Ft.)	N/A	N/A	3.657	3.496
Hp FBH or Storm (Feet)	N/A	N/A	14.27	13.60
AS Peak Discharge FBH/Storm (CFS)	N/A	N/A	52814.	48958.
AS Integ. Dist. FBH or Storm (Feet)	N/A	N/A	N/A	N/A
Oe/B FBH or Storm (Acre-Ft/Ft)	N/A	N/A	122.5	87.6
Uncontrolled Drainage Area (Sq.Miles)	4.55	4.55	4.55	4.55
Number of Errors	0	0	0	0
Number of Warnings	6	0	4	4

SITES Output Summary for Mountain Run 50 structure.

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	MR50FBH24BRALL
Site Identification	50
Watershed Runoff Curve Number	69.
Total Watershed Drainage Area (Sq.Miles)	26.16
Watershed Time of Concentration (Hours)	1.90
SDH Rainfall Total (Inches)	N/A
SDH Rainfall Duration (Hours)	N/A
FBH or Storm Rainfall Total (Inches)	36.00
FBH or Storm Rainfall Duration (Hours)	24.0
SDH Inflow Peak (CFS)	N/A
FBH or Storm Inflow Peak (CFS)	72806.5
Initial Reservoir Elevation (Feet)	385.18
Maximum WS SDH (Feet)	N/A
Maximum WS FBH or Storm (Feet)	406.43
Storage at Max. WS FBH or Storm (Acre-Ft)	12940.4
Top Dam (Feet)	N/A
Storage, Top Dam (Acre-Ft)	N/A
Emb. Yardage (CY)	N/A
PSH Drawdown (Days)	N/A
378 Drawdown (Days)	N/A
PS Crest (Feet)	384.10
PS Number of Conduits	1
PS Conduit Diameter (Inches)	66.0
PS Conduit Height (Feet)	N/A
PS Conduit Width (Feet)	N/A
PS Conduit Area (Sq. Feet)	23.76
Storage, PS Crest (Acre-Ft)	1730.
PS Discharge at AS Crest (CFS)	644.4
PS Discharge for SDH (CFS)	N/A
PS Discharge FBH or Storm (CFS)	804.8
AS Crest (Feet)	390.30
Storage, AS Crest (Acre-Ft)	3652.4
AS Width (Feet)	300.
AS Exit Slope (%)	3.85
AS Ret. Curve Index	0.03
AS Veg. Cover Factor	0.87
AS Maintenance Code	2
AS Max. Head SDH (Feet)	N/A
AS Peak Discharge SDH/Storm (CFS)	63966.2
AS Exit Velocity SDH or Storm (Ft/S)	31.81
AS Stress SDH or Storm (Lb./Sq.Ft.)	4.097
Hp FBH or Storm (Feet)	16.13
AS Peak Discharge FBH/Storm (CFS)	63966.
AS Integ. Dist. FBH or Storm (Feet)	N/A
Oe/B FBH or Storm (Acre-Ft/Ft)	148.6
Uncontrolled Drainage Area (Sq.Miles)	4.55
Number of Errors	0
Number of Warnings	4

MR50 FBH 24
(Breach of All
Upstream Dams)

SITES Summary Output for Mountain Run 50 structure.

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	MR11PSHRain	MR11PSHRun	MR11FBH6	MR11FBH24
Site Identification	11	11	11	11
Watershed Runoff Curve Number	67.	100.	67.	67.
Total Watershed Drainage Area (Sq.Miles)	6.45	6.45	6.45	6.45
Watershed Time of Concentration (Hours)	2.71	2.71	2.71	2.71
SDH Rainfall Total (Inches)	N/A	N/A	N/A	N/A
SDH Rainfall Duration (Hours)	N/A	N/A	N/A	N/A
FBH or Storm Rainfall Total (Inches)	N/A	N/A	28.00	36.00
FBH or Storm Rainfall Duration (Hours)	N/A	N/A	6.0	24.0
SDH Inflow Peak (CFS)	N/A	N/A	N/A	N/A
FBH or Storm Inflow Peak (CFS)	N/A	N/A	26883.8	18234.1
Initial Reservoir Elevation (Feet)	434.74	434.13	434.74	434.74
Maximum WS SDH (Feet)	N/A	N/A	N/A	N/A
Maximum WS FBH or Storm (Feet)	N/A	N/A	454.72	454.37
Storage at Max. WS FBH or Storm (Acre-Ft)	N/A	N/A	3928.1	3839.6
Top Dam (Feet)	N/A	N/A	N/A	N/A
Storage, Top Dam (Acre-Ft)	N/A	N/A	N/A	N/A
Emb. Yardage (CY)	N/A	N/A	N/A	N/A
PSH Drawdown (Days)	8.95	7.17	N/A	N/A
378 Drawdown (Days)	N/A	N/A	N/A	N/A
PS Crest (Feet)	433.20	433.20	433.20	433.20
PS Number of Conduits	1	1	1	1
PS Conduit Diameter (Inches)	30.0	30.0	30.0	30.0
PS Conduit Height (Feet)	N/A	N/A	N/A	N/A
PS Conduit Width (Feet)	N/A	N/A	N/A	N/A
PS Conduit Area (Sq. Feet)	4.91	4.91	4.91	4.91
Storage, PS Crest (Acre-Ft)	549.	549.	549.	549.
PS Discharge at AS Crest (CFS)	118.6	113.3	115.6	115.6
PS Discharge for SDH (CFS)	N/A	N/A	N/A	N/A
PS Discharge FBH or Storm (CFS)	N/A	N/A	132.9	132.4
AS Crest (Feet)	445.84	442.81	444.10	444.10
Storage, AS Crest (Acre-Ft)	2035.7	1560.0	1740.6	1740.6
AS Width (Feet)	N/A	N/A	150.	150.
AS Exit Slope (%)	N/A	N/A	3.00	3.00
AS Ret. Curve Index	N/A	N/A	0.03	0.03
AS Veg. Cover Factor	N/A	N/A	0.87	0.87
AS Maintenance Code	N/A	N/A	1	1
AS Max. Head SDH (Feet)	N/A	N/A	N/A	N/A
AS Peak Discharge SDH/Storm (CFS)	N/A	N/A	17353.1	16455.1
AS Exit Velocity SDH or Storm (Ft/S)	N/A	N/A	22.61	22.18
AS Stress SDH or Storm (Lb./Sq.Ft.)	N/A	N/A	0.308	0.298
Hp FBH or Storm (Feet)	N/A	N/A	10.62	10.27
AS Peak Discharge FBH/Storm (CFS)	N/A	N/A	17353.	16455.
AS Integ. Dist. FBH or Storm (Feet)	N/A	N/A	N/A	N/A
Oe/B FBH or Storm (Acre-Ft/Ft)	N/A	N/A	43.8	61.1
Uncontrolled Drainage Area (Sq.Miles)	6.45	6.45	6.45	6.45
Number of Errors	0	0	0	0
Number of Warnings	0	0	0	0

SITES Summary Output for Mountain Run 11 structure.

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SITES XEQ 05/21/2015 WATER RESOURCE SITE ANALYSIS COMPUTER PROGRAM
VER 2005.1.8 (USER MANUAL - DATED DECEMBER 2005)
TIME 10:56:32

***** 80-80 LIST OF INPUT Data *****

SITES	01/01/2005MR	Mountain Run 50	26.16	A1
SAVMOV	0 101			
SAVMOV	101 1			1
*	Mountain Run Dam No 13			
*	Elevation data from 2013 topo survey			
*	stage-storage from Asbuilt and or. design folder (4/59)			
*	Watershed Data - NLCD 2014, VGIN DEM 2014, SSURGO 2014			
STRUCTURE 13	MR 13 Asbuilt storage			
	390		0	
	399		42	
	400		60	
	408		312	
	414		670	
	420		1200	
	430		1600	
ENDTABLE				
WSDATA	5S 132	74	3.54	1.84
BASEFLOW		1		
PDIRECT	1.4	8.53	12.7	
POOLDATA	ELEV	398.2	398.2	SC
PSINLET		.9	12	
PSDATA	1	181	24	
ASDATA	41 320	100		
ASCREST	ELEV	413.3		
ASINSURF	41		0.03	
ASINLET	41	0.0	0.0	
	100		20	
		3	0.0	3
ENDTABLE				
ASEXSURF	41		0.03	
		.87	0	
		1		
		1	0	
		.01		
ENDTABLE				
ASEXIT	41	N		100
BTMWIDTH	FEET	100		
GO,DESIGN	NL			
SAVMOV	2 101 10		13	
SAVMOV	101 2			3
*	Route MR13 to MR50 reservoir			
XSECTN	3	390	387	
		388.00	12.8	
		390.00	324.8	
		392.00	1838	
		394.00	4261	
		396.00	7809	
		398.00	12254	
		400.00	17572	
		402.00	23751	
		404.00	30789	
			7368	
			599	
			0.00100254	
			371	
			403	
			468	
			494	
			521	
			547	
			573	
			0.00100254	
ENDTABLE				
GO,REACH	1 MR13 3	2753	2500	6

SAVMOV	2	101	3	R13		
SAVMOV	0	101				
SAVMOV	101	1			2	
*	Mountain Run	50	subwatershed	3		
WSDATA	5S	3 1	73	1.93	1.16	
BASEFLOW			1			
PDIRECT	1.4		8.53	12.7		
GO,DESIGN						
SAVMOV	2	101	13	3		
SAVMOV	0	101				
SAVMOV	101	1			2	
*	Mountain Run	50	subwatershed	2		
WSDATA	5S	2 1	71	2.15	1.75	
BASEFLOW			1			
PDIRECT	1.4		8.53	12.7		
GO,DESIGN						
SAVMOV	2	101	16	2		
SAVMOV	0	101				
SAVMOV	101	1			2	
*	Mountain Run	Subwatershed	1			
WSDATA	5S	1 1	57	1.95	2.34	
BASEFLOW			1			
PDIRECT	1.4		8.53	12.7		
GO,DESIGN						
SAVMOV	2	101	5	1		
SAVMOV	0	101				
SAVMOV	101	1			1	
*	Mountain Run	Dam No	8A			
*	Watershed Data - NLCD 2014, VGIN DEM 2014, SSURGO 2014					
*	Elevations from 2013 topo survey and VGIN3m data					
*	stage-storage from asbuilts and design folder (8/58)					
STRUCTURE	8A	MR8A	As-built storage			
		430		0		
		440		20		
		445		73		
		450		240		
		459.5		1000		
		465		1870		
		470		2860		
ENDTABLE						
WSDATA	5S	8A2	61	5.59	3.05	
BASEFLOW			1			
PDIRECT	1.4		8.53	12.7		
POOLDATA	ELEV		444.2	444.2		SC
PSINLET		.9	12			
PSDATA	1	212	24		0.013	432
ASDATA	41	670	300		0.03	2
ASCREST	ELEV		458.7	3		
ASINSURF	41		.03			
ASINLET	41		0.0	20	0.0	3
		120	4	320	6	
ENDTABLE						
ASEXSURF	41		0.03			
			.87	0		
			1			
			1	0		
			.01			
ENDTABLE						
ASEXIT	41	N			250	

BTMWIDTH FEET 125
 GO,DESIGN NL
 SAVMOV 2 101 19 8A 3
 SAVMOV 101 2
 * route Dam 8A to junction 1
 XSECTN 6 415 412
 412.50 1.94 3.05 11.7 0.00277360
 415.00 152.3 71.4 44.3 0.00277360
 418.00 1494 466.3 185 0.00277360
 421.00 5087 1116 243 0.00277360
 424.00 11050 1928 298 0.00277360
 427.00 19666 2890 341 0.00277360
 429.00 26914 3596 365 0.00277360
 431.00 35390 4349 386 0.00277360
 ENDTABLE
 GO,REACH 1 MR8A 6 10380 7900 6
 SAVMOV 2 101 6 R8A
 SAVMOV 0 101
 SAVMOV 101 1 1
 * Mountain Run 11 Dam
 * Watershed Data - NLCD 2014, VGIN DEM 2014, SSURGO 2014
 * Elevation and stage/storage data - Topo Survey 2014
 * ASW profile - Asbuilt 1958
 STRUCTURE 11 MR 11 2014 Sediment Survey
 415 0.00
 420 10.54
 424 29.56
 428 45.24
 432 57.45
 436 88.46
 440 121.38
 444 153.90
 448 185.84
 452 233.14
 456 272.05
 460 337.95
 ENDTABLE
 WSDATA 5C 112 67 6.45 2.71
 BASEFLOW 1
 PDIRECT 1.4 8.53 12.7
 POOLDATA ELEV 433.2 433.2 422.2 SC
 PSINLET .9 14
 PSDATA 1 208 30 0.013 411.2
 ASDATA 41 670 394 3 0.03 2
 ASCREST ELEV 444.1
 ASINSURF 41 0.03
 ASINLET 41 0.0 0.0 20 0.0 3
 55 2 414 4.9
 ENDTABLE
 ASEXSURF 41 0.03 0
 .87 0
 1 0
 1 0
 .01
 ENDTABLE
 ASEXIT 41 N 100
 BTMWIDTH FEET 150
 GO,DESIGN NL
 SAVMOV 2 101 8 11

SAVMOV 101 2 3
 * route Dam 11 to junction 1
 XSECTN 7 410 401
 402.00 1.99 3.56 7.74 0.00148378
 410.00 656.9 282.5 128 0.00148378
 415.00 4837 1636 338 0.00148378
 420.00 14055 3620 480 0.00148378
 424.50 28662 6315 666 0.00148378
 ENDTABLE
 GO,REACH 1 MR11 7 7865 3900 6
 SAVMOV 2 101 7 R11
 ADDMOV
 * JCT 1: confluence of Mountain Run (below MR11 dam) and unnam
 (below MR8A dam)
 ADDMOV 18 1 4
 SAVMOV 101 2 3
 * Route Jct1 (Dam 8A + Dam11) to Jct 2 (USGS Gage)
 XSECTN 17 401 396
 396.00 0.15 0.67 7.45 0.001349
 398.00 53.4 38.7 26.7 0.001349
 400.00 201.9 113.3 52.9 0.001349
 402.00 641.4 389.2 261 0.001349
 404.00 2684 1210 515 0.001349
 406.00 6685 2354 631 0.001349
 408.00 12752 3711 718 0.001349
 410.00 20775 5234 805 0.001349
 ENDTABLE
 GO,REACH 1 MMR2 17 5339 3035 6
 SAVMOV 2 101 17 MR2
 * JCT2: Moutain Run and SR 641 (Gibson Mill Rd)
 * USGS Stream Gage 01665000
 ADDMOV 15 2 4
 SAVMOV 101 2 3
 * Route Jct2 (USGS gage) to Jct3 (MR50 reservoir)
 XSECTN 14 387 383
 384.00 2.54 5.89 16.3 0.00081659
 386.00 222.3 392.2 878 0.00081659
 388.00 3667 2790 1470 0.00081659
 390.00 12070 6095 1727 0.00081659
 392.00 24966 9617 1808 0.00081659
 394.00 41766 13316 1882 0.00081659
 396.00 62461 17128 1929 0.00081659
 398.00 86518 21035 1978 0.00081659
 400.00 114393 25022 2006 0.00081659
 ENDTABLE
 GO,REACH 1 MMR3 14 6074 5500 6
 SAVMOV 2 101 14 MR3
 * JCT 3: Mountain Run 50 Reservoir (Pelham Lake)
 ADDMOV 12 3 4
 ADDMOV
 SAVMOV 101 1 1
 * Mountain Run 50 Dam
 * Watershed Data - NLCD 2014, VGIN DEM 2014, SSURGO 2014
 * Elevation and stage/storage data - Topo Survey 2014
 * ASW profile - Asbuilt 1970
 STRUCTURE 50 MR50 sed survey 2014
 363 0.00
 366 0.67
 370 25.92

	374	69.83			
	378	129.47			
	382	194.51			
	384	215.82			
	388	330.65			
	392	414.51			
	396	497.92			
	400	631.82			
	404	726.36			
	408	833.26			
	412	966.48			
ENDTABLE					
WSDATA	5S 50	69	4.55	1.9	6
BASEFLOW		5			
PDIRECT	1.4	8.53	12.7		
POOLDATA	ELEV		384.1	384.1	SC
PSINLET		.9	44		
PSDATA	1	192	66		.013 361.5
GRAPHICS	I				
GO,DESIGN	LCPRN				
SAVMOV	2	101 1		50	
ENDJOB					

 1SITES XEQ 05/21/2015 ----- COMMENT PAGE -----
 VER 2005.1.8 Mountain Run 50 WSID = MR

Mountain Run Dam No 13

Elevation data from 2013 topo survey

stage-storage from Asbuiltts and or. design folder (4/59)

Watershed Data - NLCD 2014, VGIN DEM 2014, SSURGO 2014

1SITES -----
 XEQ 05/21/2015 Mountain Run 50 WSID= MR
 VER 2005.1.8 MR 13 Asbuilt storage SUBW= 13
 TIME 10:56:32 SITE = 13 PASS= 1 PART= 1

***** BASIC Data *****
 CLIMATE AREA - NOT DEFINED DESIGN CLASS S = USER DEFINED

STORM DISTRIBUTION PSH..10 DAY NRCS DESIGN STORM (CHAPTER 21, NEH4 & TR-60).

STORM DISTRIBUTION USED FOR AUXILIARY SPILLWAY IS;
 NRCS DESIGN STORM RAINFALL DISTRIBUTION (CHAPTER 21, NEH4 & TR-60).

PRECIP. - P-PS,1-DAY	P-PS,10-DAY	Q-SD	Q-FB	
8.53	12.70	0.00	0.00	
WSDATA - CN	DA-SM	TC/L	-/H	QRF
74.00	3.54	1.84	0.00	0.00
SITEDATA- PERM POOL	CREST PS	FP SED	VALLEY FL	378?

	398.20	398.20	398.20	0.00	NO
	BASEFLOW 1.00	INITIAL EL 0.00	EXTRA VOL 0.00	SITE TYPE EXISTING	
PSDATA -	NO. COND 1.00	COND L 181.00	DIA/W 24.00	- / H 0.00	
	PS N 0.013	KE 0.90	WEIR L 12.00	TW EL 388.20	
	2ND STG 0.00	ORF H 0.00	ORF L 0.00	START AUX. 0.00	
ASCRESTS -	AUX.1 413.30	AUX.2 0.00	AUX.3 0.00	AUX.4 0.00	AUX.5 0.00
AUX.Data -	REF.NO. 41	RETARD. Ci 0.00	TIE STATION 320.00	INLET LENGTH 100	
AUX.Data -	INLET N 0.030	SIDE SLOPE 2.50	EXIT N 0.030	EXIT SLOPE 0.030	ACTUAL AUX? NO
BTM WIDTH -	BW1 ft 100.00	BW2 0.00	BW3 0.00	BW4 0.00	BW5 0.00

AUXILIARY SPILLWAY RATING DEVELOPED USING WSPVRT.

***** WARNING - CLIMATIC INDEX (PDIRECT) VALUE GREATER THAN 1.0
APPROPRIATE ONLY FOR LOWER SITE. VALUE SET TO 1.0

1SITES -----
 XEQ 05/21/2015 Mountain Run 50 WSID= MR
 VER 2005.1.8 MR 13 Asbuilt storage SUBW= 13
 TIME 10:56:32 SITE = 13 PASS= 1 PART= 2

PERM POOL	398.20 FT	38.3 ACFT	0.00 AC	4.7 CFS
CREST PS	398.20 FT	38.3 ACFT	0.00 AC	4.7 CFS
SED ACCUM	398.20 FT	38.3 ACFT	0.00 AC	4.7 CFS
BASEFLOW	398.38 FT	39.1 ACFT	0.00 AC	3.5 CFS
START ELEV	398.38 FT	39.1 ACFT	0.00 AC	3.5 CFS

***** MESSAGE - EXIT CHANNEL SLOPE SET TO 4%; INSUFFICIENT DESIGN INPUT DATA.

NRCS-PSH RAINFALL 1-DAY = 8.53 IN 10-DAY = 12.70 IN DA = 3.54 SM
 RUNOFF 1-DAY = 5.40 IN 10-DAY = 6.68 IN

CLIMATIC INDEX = 1.00 CN 10-DAY = 57. CN 1-DAY = 74.

PEAK = 5487.9 CFS, AT 120.6 HRS.

ROUTED RESULT - HYD TYPE EMAX VOL-MAX AMAX QMAX
 NRCS-PSH 415.57 FT 808.3 ACFT 0.00 AC 1065.2 CFS

PS STORAGE 770.0 ACFT, BETWEEN AUX. CREST AND SED. ACCUM ELEVATIONS.

DRAWDOWN (DDT) TEST 403.00 FT 154.5 ACFT 47.60 CFS
 CONTROL IS 0.150 DETENTION STORAGE

DRAWDOWN TIME = 8.17 DAYS, TO 3.6 CFS (LIMIT = 10.00 DAYS)

 RATING TABLE DEVELOPED, SITE = 13 :
 BY PROGRAM FOR PS AND AUX. SPILLWAYS
 AUX. RATING USED WSPVRT METHOD.

RATING TABLE NUMBER 1					
	ELEV. FEET	Q-TOTAL CFS	Q-PS CFS	Q-AUX. CFS	VOLUME AC-FT
1	398.20	0.00	0.00	0.00	38.27
2	398.47	5.14	5.14	0.00	39.51
3	398.73	14.54	14.54	0.00	40.76
4	399.00	26.71	26.71	0.00	42.03
					FULL CONDUIT FLOW, ELEV = 399.27 FT
5	399.27	41.12	41.12	0.00	46.84
6	401.02	44.31	44.31	0.00	92.22
7	402.78	47.25	47.25	0.00	147.47
8	404.53	50.01	50.01	0.00	202.72
9	406.28	52.63	52.63	0.00	257.96
10	408.04	55.12	55.12	0.00	314.29
11	409.79	57.50	57.50	0.00	418.93
12	411.55	59.79	59.79	0.00	523.58
13	413.30	62.00	62.00	0.00	628.23
14	414.13	247.45	63.02	184.43	681.92
15	414.97	637.60	64.03	573.57	755.68
16	416.47	1716.49	65.80	1650.69	888.45
17	418.31	3542.36	67.90	3474.45	1050.72
18	421.65	8343.23	71.57	8271.66	1266.00
19	425.83	16235.75	75.91	16159.84	1433.00
20	430.00	26407.12	80.01	26327.11	1600.00

1SITES -----
 XEQ 05/21/2015 Mountain Run 50 WSID= MR
 VER 2005.1.8 MR 13 Asbuilt storage SUBW= 13
 TIME 10:56:32 SITE = 13 PASS= 1 PART= 3

AUX. CREST 413.30 FT 628.2 ACFT 0.00 AC 62.0 CFS

PS STORAGE 590.0 ACFT, BETWEEN AUX. CREST AND SED. ACCUM ELEVATIONS.

START ELEV 398.39 FT 39.1 ACFT 0.00 AC 3.6 CFS

ELEVATION OF LOW POINT IS ZERO. NO CRITERIA CHECK MADE FOR
 STRUCTURE CLASSIFICATION.

RATING TABLE DEVELOPED, SITE = 13 :
BY PROGRAM FOR PS AND AUX. SPILLWAYS
AUX. RATING USED WSPVRT METHOD.

RATING TABLE NUMBER 2

	ELEV. FEET	Q-TOTAL CFS	Q-PS CFS	Q-AUX. CFS	VOLUME AC-FT	AREA ACRE
1	398.20	0.00	0.00	0.00	38.27	0.00
2	398.47	5.14	5.14	0.00	39.51	0.00
3	398.73	14.54	14.54	0.00	40.76	0.00
4	399.00	26.71	26.71	0.00	42.03	0.00
					FULL CONDUIT FLOW, ELEV = 399.27 FT	
5	399.27	41.12	41.12	0.00	46.84	0.00
6	401.02	44.31	44.31	0.00	92.22	0.00
7	402.78	47.25	47.25	0.00	147.47	0.00
8	404.53	50.01	50.01	0.00	202.72	0.00
9	406.28	52.63	52.63	0.00	257.96	0.00
10	408.04	55.12	55.12	0.00	314.29	0.00
11	409.79	57.50	57.50	0.00	418.93	0.00
12	411.55	59.79	59.79	0.00	523.58	0.00
13	413.30	62.00	62.00	0.00	628.23	0.00
14	414.13	247.45	63.02	184.43	681.92	0.00
15	414.97	637.60	64.03	573.57	755.68	0.00
16	416.47	1716.49	65.80	1650.69	888.45	0.00
17	418.31	3542.36	67.90	3474.45	1050.72	0.00
18	421.65	8343.23	71.57	8271.66	1266.00	0.00
19	425.83	16235.75	75.91	16159.84	1433.00	0.00
20	430.00	26407.12	80.01	26327.11	1600.00	0.00

Inflow Hyd 1 PSH-Peak = 1065.18 CFS at 122.38 hrs., Location Point
HYDOUT 10 13

1SITES XEQ 05/21/2015 ----- COMMENT PAGE -----
VER 2005.1.8 Mountain Run 50 WSID = MR

Route MR13 to MR50 reservoir

Inflow Hyd 1 PSH-Peak = 1040.63 CFS at 122.84 hrs., Location Point
HYDOUT 3 R13

1SITES XEQ 05/21/2015 ----- COMMENT PAGE -----
VER 2005.1.8 Mountain Run 50 WSID = MR

Mountain Run 50 subwatershed 3

1SITES -----
XEQ 05/21/2015 Mountain Run 50 WSID= MR
VER 2005.1.8 SUBW= 3
TIME 10:56:32 PASS= 1 PART= 4

***** BASIC Data *****
CLIMATE AREA - NOT DEFINED DESIGN CLASS S = USER DEFINED

STORM DISTRIBUTION PSH..10 DAY NRCS DESIGN STORM (CHAPTER 21, NEH4 & TR-60).

STORM DISTRIBUTION USED FOR AUXILIARY SPILLWAY IS;
NRCS DESIGN STORM RAINFALL DISTRIBUTION (CHAPTER 21, NEH4 & TR-60).

PRECIP. - P-PS,1-DAY	P-PS,10-DAY	Q-SD	Q-FB
8.53	12.70	0.00	0.00
WSDATA - CN	DA-SM	TC/L	-/H
73.00	1.93	1.16	0.00
SITEDATA - BASEFLOW	INITIAL EL	EXTRA VOL	SITE TYPE
1.00	0.00	0.00	NULL

***** WARNING - CLIMATIC INDEX (PDIRECT) VALUE GREATER THAN 1.0
APPROPRIATE ONLY FOR LOWER SITE. VALUE SET TO 1.0

NRCS-PSH RAINFALL 1-DAY = 8.53 IN 10-DAY = 12.70 IN DA = 1.93 SM
RUNOFF 1-DAY = 5.28 IN 10-DAY = 6.52 IN

CLIMATIC INDEX = 1.00 CN 10-DAY = 56. CN 1-DAY = 73.

PEAK = 3877.9 CFS, AT 120.3 HRS.

Inflow Hyd 1 PSH-Peak = 3877.88 CFS at 120.30 hrs., Location Point
HYDOUT 13 3

1SITES XEQ 05/21/2015 ----- COMMENT PAGE -----
VER 2005.1.8 Mountain Run 50 WSID = MR

Mountain Run 50 subwatershed 2

1SITES -----
XEQ 05/21/2015 Mountain Run 50 WSID= MR
VER 2005.1.8 SUBW= 2
TIME 10:56:32 PASS= 1 PART= 5

***** BASIC Data *****
CLIMATE AREA - NOT DEFINED DESIGN CLASS S = USER DEFINED

STORM DISTRIBUTION PSH..10 DAY NRCS DESIGN STORM (CHAPTER 21, NEH4 & TR-60).

STORM DISTRIBUTION USED FOR AUXILIARY SPILLWAY IS;
NRCS DESIGN STORM RAINFALL DISTRIBUTION (CHAPTER 21, NEH4 & TR-60).

PRECIP. - P-PS,1-DAY	P-PS,10-DAY	Q-SD	Q-FB
8.53	12.70	0.00	0.00

WSDATA -	CN 71.00	DA-SM 2.15	TC/L 1.75	-/H 0.00	QRF 0.00
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SITEDATA - BASEFLOW	INITIAL EL 1.00	EXTRA VOL 0.00	SITE TYPE NULL
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***** WARNING - CLIMATIC INDEX (PDIRECT) VALUE GREATER THAN 1.0
APPROPRIATE ONLY FOR LOWER SITE. VALUE SET TO 1.0

NRCS-PSH RAINFALL	1-DAY = 8.53 IN	10-DAY = 12.70 IN	DA = 2.15 SM
RUNOFF	1-DAY = 5.04 IN	10-DAY = 6.03 IN	

CLIMATIC INDEX = 1.00 CN 10-DAY = 53. CN 1-DAY = 71.

PEAK = 3354.8 CFS, AT 120.7 HRS.

Inflow Hyd 1 PSH-Peak = 3354.82 CFS at 120.66 hrs., Location Point
HYDOUT 16 2

1SITES XEQ 05/21/2015 ----- COMMENT PAGE -----
VER 2005.1.8 Mountain Run 50 WSID = MR

Mountain Run Subwatershed 1

1SITES -----
XEQ 05/21/2015 Mountain Run 50 WSID= MR
VER 2005.1.8 SUBW= 1
TIME 10:56:32 PASS= 1 PART= 6

***** BASIC Data *****
CLIMATE AREA - NOT DEFINED DESIGN CLASS S = USER DEFINED

STORM DISTRIBUTION PSH..10 DAY NRCS DESIGN STORM (CHAPTER 21, NEH4 & TR-60).

STORM DISTRIBUTION USED FOR AUXILIARY SPILLWAY IS;
NRCS DESIGN STORM RAINFALL DISTRIBUTION (CHAPTER 21, NEH4 & TR-60).

PRECIP. - P-PS,1-DAY	P-PS,10-DAY	Q-SD	Q-FB
8.53	12.70	0.00	0.00

WSDATA -	CN 57.00	DA-SM 1.95	TC/L 2.34	-/H 0.00	QRF 0.00
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SITEDATA - BASEFLOW	INITIAL EL 1.00	EXTRA VOL 0.00	SITE TYPE NULL
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***** WARNING - CLIMATIC INDEX (PDIRECT) VALUE GREATER THAN 1.0
APPROPRIATE ONLY FOR LOWER SITE. VALUE SET TO 1.0

NRCS-PSH RAINFALL 1-DAY = 8.53 IN 10-DAY = 12.70 IN DA = 1.95 SM
RUNOFF 1-DAY = 3.38 IN 10-DAY = 3.46 IN

CLIMATIC INDEX = 1.00 CN 10-DAY = 38. CN 1-DAY = 57.

PEAK = 1968.0 CFS, AT 120.9 HRS.

Inflow Hyd 1 PSH-Peak = 1967.97 CFS at 120.92 hrs., Location Point
HYDOUT 5 1

1SITES XEQ 05/21/2015 ----- COMMENT PAGE -----
VER 2005.1.8 Mountain Run 50 WSID = MR

Mountain Run Dam No 8A

Watershed Data - NLCD 2014, VGIN DEM 2014, SSURGO 2014

Elevations from 2013 topo survey and VGIN3m data

stage-storage from asbuilts and design folder (8/58)

1SITES -----
XEQ 05/21/2015 Mountain Run 50 WSID= MR
VER 2005.1.8 MR8A As-built storage SUBW= 8A
TIME 10:56:32 SITE = 8A PASS= 1 PART= 7

***** BASIC Data ***** ***** DESIGN CLASS S = USER DEFINED *****
CLIMATE AREA - NOT DEFINED

STORM DISTRIBUTION PSH..10 DAY NRCS DESIGN STORM (CHAPTER 21, NEH4 & TR-60).

STORM DISTRIBUTION USED FOR AUXILIARY SPILLWAY IS;
NRCS DESIGN STORM RAINFALL DISTRIBUTION (CHAPTER 21, NEH4 & TR-60).

PRECIP. - P-PS,1-DAY P-PS,10-DAY Q-SD Q-FB
8.53 12.70 0.00 0.00

WSDATA - CN DA-SM TC/L -/H QRF
61.00 5.59 3.05 0.00 0.00

SITEDATA- PERM POOL CREST PS FP SED VALLEY FL 378?
444.20 444.20 444.20 0.00 NO

BASEFLOW INITIAL EL EXTRA VOL SITE TYPE
1.00 0.00 0.00 EXISTING

PSDATA - NO. COND COND L DIA/W -/H
1.00 212.00 24.00 0.00

PS N KE WEIR L TW EL
0.013 0.90 12.00 432.00

2ND STG ORF H ORF L START AUX.
0.00 0.00 0.00 0.00

ASCRESTS -	AUX.1 458.70	AUX.2 0.00	AUX.3 0.00	AUX.4 0.00	AUX.5 0.00
AUX.Data -	REF.NO. 41	RETARD. Ci 0.00	TIE STATION 670.00	INLET LENGTH 300	
AUX.Data -	INLET N 0.030	SIDE SLOPE 3.00	EXIT N 0.030	EXIT SLOPE 0.030	ACTUAL AUX? NO
BTM WIDTH -	BW1 ft 125.00	BW2 0.00	BW3 0.00	BW4 0.00	BW5 0.00

AUXILIARY SPILLWAY RATING DEVELOPED USING WSPVRT.

***** WARNING - CLIMATIC INDEX (PDIRECT) VALUE GREATER THAN 1.0
 APPROPRIATE ONLY FOR LOWER SITE. VALUE SET TO 1.0

1SITES -----
 XEQ 05/21/2015 Mountain Run 50 WSID= MR
 VER 2005.1.8 MR8A As-built storage SUBW= 8A
 TIME 10:56:32 SITE = 8A PASS= 1 PART= 8

PERM POOL	444.20 FT	64.5 ACFT	0.00 AC	13.7 CFS
CREST PS	444.20 FT	64.5 ACFT	0.00 AC	13.7 CFS
SED ACCUM	444.20 FT	64.5 ACFT	0.00 AC	13.7 CFS
BASEFLOW	444.48 FT	67.5 ACFT	0.00 AC	5.6 CFS
START ELEV	444.48 FT	67.5 ACFT	0.00 AC	5.6 CFS

***** MESSAGE - EXIT CHANNEL SLOPE SET TO 4%; INSUFFICIENT DESIGN INPUT DATA.

NRCS-PSH RAINFALL 1-DAY = 8.53 IN 10-DAY = 12.70 IN DA = 5.59 SM
 RUNOFF 1-DAY = 3.85 IN 10-DAY = 4.16 IN

CLIMATIC INDEX = 1.00 CN 10-DAY = 42. CN 1-DAY = 61.

PEAK = 4788.1 CFS, AT 121.4 HRS.

ROUTED RESULT - HYD TYPE EMAX VOL-MAX AMAX QMAX
 NRCS-PSH 459.91 FT 1064.8 ACFT 0.00 AC 486.8 CFS

PS STORAGE 1000.3 ACFT, BETWEEN AUX. CREST AND SED. ACCUM ELEVATIONS.

DRAWDOWN (DDT) TEST 449.31 FT 217.1 ACFT 49.04 CFS
 CONTROL IS 0.150 DETENTION STORAGE

TIME LIMIT = 10.00 DAYS; FLOW WAS 26.52 CFS, ELEV = 445.00 FT

 RATING TABLE DEVELOPED, SITE = 8A :

BY PROGRAM FOR PS AND AUX. SPILLWAYS
AUX. RATING USED WSPVRT METHOD.

RATING TABLE NUMBER 1

	ELEV. FEET	Q-TOTAL CFS	Q-PS CFS	Q-AUX. CFS	VOLUME AC-FT	AREA ACRE
1	444.20	0.00	0.00	0.00	64.52	0.00
2	444.48	5.39	5.39	0.00	67.45	0.00
3	444.75	15.26	15.26	0.00	70.37	0.00
4	445.03	28.03	28.03	0.00	73.94	0.00
					FULL CONDUIT FLOW, ELEV = 445.30 FT	
5	445.30	43.15	43.15	0.00	83.15	0.00
6	446.98	45.82	45.82	0.00	139.08	0.00
7	448.65	48.31	48.31	0.00	195.01	0.00
8	450.33	50.68	50.68	0.00	266.20	0.00
9	452.00	52.94	52.94	0.00	400.16	0.00
10	453.68	55.12	55.12	0.00	534.12	0.00
11	455.35	57.20	57.20	0.00	668.08	0.00
12	457.03	59.22	59.22	0.00	802.04	0.00
13	458.70	61.17	61.17	0.00	936.00	0.00
14	459.27	178.08	61.81	116.26	981.20	0.00
15	459.83	430.48	62.45	368.03	1052.20	0.00
16	460.85	1148.09	63.58	1084.51	1213.07	0.00
17	462.09	2332.40	64.94	2267.46	1409.69	0.00
18	464.35	5382.07	67.33	5314.74	1767.18	0.00
19	467.17	10287.54	70.21	10217.33	2300.65	0.00
20	470.00	16486.13	72.97	16413.15	2860.00	0.00

1SITES -----
 XEQ 05/21/2015 Mountain Run 50 WSID= MR
 VER 2005.1.8 MR8A As-built storage SUBW= 8A
 TIME 10:56:32 SITE = 8A PASS= 1 PART= 9

AUX. CREST 458.70 FT 936.0 ACFT 0.00 AC 61.2 CFS

PS STORAGE 871.5 ACFT, BETWEEN AUX. CREST AND SED. ACCUM ELEVATIONS.

START ELEV 445.00 FT 73.0 ACFT 0.00 AC 26.5 CFS

ELEVATION OF LOW POINT IS ZERO. NO CRITERIA CHECK MADE FOR
STRUCTURE CLASSIFICATION.

 RATING TABLE DEVELOPED, SITE = 8A :
 BY PROGRAM FOR PS AND AUX. SPILLWAYS
 AUX. RATING USED WSPVRT METHOD.

RATING TABLE NUMBER 2

	ELEV. FEET	Q-TOTAL CFS	Q-PS CFS	Q-AUX. CFS	VOLUME AC-FT	AREA ACRE
1	444.20	0.00	0.00	0.00	64.52	0.00
2	444.48	5.39	5.39	0.00	67.45	0.00
3	444.75	15.26	15.26	0.00	70.37	0.00
4	445.03	28.03	28.03	0.00	73.94	0.00

	FULL CONDUIT FLOW, ELEV = 445.30 FT					
5	445.30	43.15	43.15	0.00	83.15	0.00
6	446.98	45.82	45.82	0.00	139.08	0.00
7	448.65	48.31	48.31	0.00	195.01	0.00
8	450.33	50.68	50.68	0.00	266.20	0.00
9	452.00	52.94	52.94	0.00	400.16	0.00
10	453.68	55.12	55.12	0.00	534.12	0.00
11	455.35	57.20	57.20	0.00	668.08	0.00
12	457.03	59.22	59.22	0.00	802.04	0.00
13	458.70	61.17	61.17	0.00	936.00	0.00
14	459.27	178.08	61.81	116.26	981.20	0.00
15	459.83	430.48	62.45	368.03	1052.20	0.00
16	460.85	1148.09	63.58	1084.51	1213.07	0.00
17	462.09	2332.40	64.94	2267.46	1409.69	0.00
18	464.35	5382.07	67.33	5314.74	1767.18	0.00
19	467.17	10287.54	70.21	10217.33	2300.65	0.00
20	470.00	16486.13	72.97	16413.15	2860.00	0.00

Inflow Hyd 1 PSH-Peak = 486.77 CFS at 124.68 hrs., Location Point
HYDOUT 19 8A

1SITES XEQ 05/21/2015 ----- COMMENT PAGE -----
VER 2005.1.8 Mountain Run 50 WSID = MR

route Dam 8A to junction 1

Inflow Hyd 1 PSH-Peak = 491.59 CFS at 125.45 hrs., Location Point
HYDOUT 6 R8A

1SITES XEQ 05/21/2015 ----- COMMENT PAGE -----
VER 2005.1.8 Mountain Run 50 WSID = MR

Mountain Run 11 Dam

Watershed Data - NLCD 2014, VGIN DEM 2014, SSURGO 2014

Elevation and stage/storage data - Topo Survey 2014

ASW profile - Asbuilt 1958

1SITES -----
XEQ 05/21/2015 Mountain Run 50 WSID= MR
VER 2005.1.8 MR 11 2014 Sediment Survey SUBW= 11
TIME 10:56:32 SITE = 11 PASS= 1 PART= 10

***** BASIC Data ***** ***** DESIGN CLASS C *****
CLIMATE AREA - NOT DEFINED

STORM DISTRIBUTION PSH..10 DAY NRCS DESIGN STORM (CHAPTER 21, NEH4 & TR-60).

STORM DISTRIBUTION USED FOR AUXILIARY SPILLWAY IS;
NRCS DESIGN STORM RAINFALL DISTRIBUTION (CHAPTER 21, NEH4 & TR-60).

PRECIP. -	P-PS, 1-DAY 8.53	P-PS, 10-DAY 12.70	Q-SD 0.00	Q-FB 0.00	
WSDATA -	CN 67.00	DA-SM 6.45	TC/L 2.71	-/H 0.00	QRF 0.00
SITEDATA -	PERM POOL 433.20	CREST PS 433.20	FP SED 422.20	VALLEY FL 0.00	378? NO
	BASEFLOW 1.00	INITIAL EL 0.00	EXTRA VOL 0.00	SITE TYPE EXISTING	
PSDATA -	NO. COND 1.00	COND L 208.00	DIA/W 30.00	-/H 0.00	
	PS N 0.013	KE 0.90	WEIR L 14.00	TW EL 411.20	
	2ND STG 0.00	ORF H 0.00	ORF L 0.00	START AUX. 0.00	
ASCRESTS -	AUX.1 444.10	AUX.2 0.00	AUX.3 0.00	AUX.4 0.00	AUX.5 0.00
AUX.Data -	REF.NO. 41	RETARD. Ci 0.00	TIE STATION 670.00	INLET LENGTH 394	
AUX.Data -	INLET N 0.030	SIDE SLOPE 3.00	EXIT N 0.030	EXIT SLOPE 0.030	ACTUAL AUX? NO
BTM WIDTH -	BW1 ft 150.00	BW2 0.00	BW3 0.00	BW4 0.00	BW5 0.00

AUXILIARY SPILLWAY RATING DEVELOPED USING WSPVRT.

***** WARNING - CLIMATIC INDEX (PDIRECT) VALUE GREATER THAN 1.0
APPROPRIATE ONLY FOR LOWER SITE. VALUE SET TO 1.0

1SITES -----

XEQ 05/21/2015	Mountain Run 50	WSID= MR
VER 2005.1.8	MR 11 2014 Sediment Survey	SUBW= 11
TIME 10:56:32	SITE = 11	PASS= 1 PART= 11

PERM POOL	433.20 FT	536.1 ACFT	66.75 AC	99.7 CFS
CREST PS	433.20 FT	536.1 ACFT	66.75 AC	99.7 CFS
SED ACCUM	433.20 FT	536.1 ACFT	66.75 AC	99.7 CFS
BASEFLOW	433.43 FT	551.6 ACFT	68.53 AC	6.4 CFS
START ELEV	433.43 FT	551.6 ACFT	68.53 AC	6.5 CFS

***** MESSAGE - EXIT CHANNEL SLOPE SET TO 4%; INSUFFICIENT DESIGN INPUT DATA.

NRCS-PSH RAINFALL 1-DAY = 8.53 IN 10-DAY = 12.70 IN DA = 6.45 SM
RUNOFF 1-DAY = 4.56 IN 10-DAY = 5.36 IN

CLIMATIC INDEX = 1.00 CN 10-DAY = 49. CN 1-DAY = 67.

PEAK = 6621.9 CFS, AT 121.2 HRS.

ROUTED RESULT - HYD TYPE EMAX VOL-MAX AMAX QMAX
NRCS-PSH 445.24 FT 1921.0 ACFT 163.82 AC 603.6 CFS

PS STORAGE 1384.9 ACFT, BETWEEN AUX. CREST AND SED. ACCUM ELEVATIONS.

DRAWDOWN (DDT) TEST 436.04 FT 757.0 ACFT 100.43 CFS
CONTROL IS 0.150 DETENTION STORAGE

TIME LIMIT = 10.00 DAYS; FLOW WAS 7.85 CFS, ELEV = 433.48 FT

RATING TABLE DEVELOPED, SITE = 11 :
BY PROGRAM FOR PS AND AUX. SPILLWAYS
AUX. RATING USED WSPVRT METHOD.

RATING TABLE NUMBER 1					
ELEV. FEET	Q-TOTAL CFS	Q-PS CFS	Q-AUX. CFS	VOLUME AC-FT	AREA ACRE
1 433.20	0.00	0.00	0.00	536.05	66.75
2 433.63	12.26	12.26	0.00	565.51	70.09
3 434.06	34.67	34.67	0.00	596.40	73.43
4 434.49	63.70	63.70	0.00	628.73	76.77
				FULL CONDUIT FLOW, ELEV = 434.92 FT	
5 434.92	98.07	98.07	0.00	662.50	80.10
6 436.07	100.50	100.50	0.00	759.50	89.03
7 437.22	102.79	102.79	0.00	867.06	98.47
8 438.36	105.03	105.03	0.00	985.45	107.91
9 439.51	107.23	107.23	0.00	1114.67	117.36
10 440.66	109.38	109.38	0.00	1254.70	126.73
11 441.81	111.49	111.49	0.00	1405.44	136.06
12 442.95	113.56	113.56	0.00	1566.89	145.39
13 444.10	115.59	115.59	0.00	1739.03	154.70
14 444.90	371.43	116.98	254.45	1864.53	161.05
15 445.69	908.51	118.35	790.16	1995.08	167.39
16 447.12	2347.71	120.78	2226.93	2242.80	178.82
17 448.87	4730.98	123.69	4607.29	2569.22	196.13
18 452.05	10917.13	128.80	10788.33	3252.70	233.63
19 456.02	20962.65	134.92	20827.72	4258.21	272.46
20 460.00	33772.88	140.78	33632.10	5471.41	337.95

1SITES -----
XEQ 05/21/2015 Mountain Run 50 WSID= MR
VER 2005.1.8 MR 11 2014 Sediment Survey SUBW= 11
TIME 10:56:32 SITE = 11 PASS= 1 PART= 12

AUX. CREST 444.10 FT 1739.0 ACFT 154.70 AC 115.6 CFS

PS STORAGE 1203.0 ACFT, BETWEEN AUX. CREST AND SED. ACCUM ELEVATIONS.

START ELEV 433.48 FT 554.7 ACFT 68.89 AC 7.8 CFS

ELEVATION OF LOW POINT IS ZERO. NO CRITERIA CHECK MADE FOR STRUCTURE CLASSIFICATION.

RATING TABLE DEVELOPED, SITE = 11 :
BY PROGRAM FOR PS AND AUX. SPILLWAYS
AUX. RATING USED WSPVRT METHOD.

RATING TABLE NUMBER 2

	ELEV. FEET	Q-TOTAL CFS	Q-PS CFS	Q-AUX. CFS	VOLUME AC-FT	AREA ACRE
1	433.20	0.00	0.00	0.00	536.05	66.75
2	433.63	12.26	12.26	0.00	565.51	70.09
3	434.06	34.67	34.67	0.00	596.40	73.43
4	434.49	63.70	63.70	0.00	628.73	76.77
					FULL CONDUIT FLOW, ELEV =	434.92 FT
5	434.92	98.07	98.07	0.00	662.50	80.10
6	436.07	100.50	100.50	0.00	759.50	89.03
7	437.22	102.79	102.79	0.00	867.06	98.47
8	438.36	105.03	105.03	0.00	985.45	107.91
9	439.51	107.23	107.23	0.00	1114.67	117.36
10	440.66	109.38	109.38	0.00	1254.70	126.73
11	441.81	111.49	111.49	0.00	1405.44	136.06
12	442.95	113.56	113.56	0.00	1566.89	145.39
13	444.10	115.59	115.59	0.00	1739.03	154.70
14	444.90	371.43	116.98	254.45	1864.53	161.05
15	445.69	908.51	118.35	790.16	1995.08	167.39
16	447.12	2347.71	120.78	2226.93	2242.80	178.82
17	448.87	4730.98	123.69	4607.29	2569.22	196.13
18	452.05	10917.13	128.80	10788.33	3252.70	233.63
19	456.02	20962.65	134.92	20827.72	4258.21	272.46
20	460.00	33772.88	140.78	33632.10	5471.41	337.95

Inflow Hyd 1 PSH-Peak = 603.59 CFS at 124.49 hrs., Location Point
HYDOUT 8 11

1SITES XEQ 05/21/2015 ----- COMMENT PAGE -----
VER 2005.1.8 Mountain Run 50 WSID = MR

route Dam 11 to junction 1

Inflow Hyd 1 PSH-Peak = 609.03 CFS at 125.00 hrs., Location Point
HYDOUT 7 R11

PSH-Hydrograph No. 1, Peak = 491.59 cfs at 125.45 hours. DA = 5.59
Hydrograph No. 2, Peak = 609.03 cfs at 125.00 hours. DA = 6.45

PSH Add Hydrograph Results, Peak = 1095.08 cfs at 125.34 hours. DA = 12.04

1SITES XEQ 05/21/2015 ----- COMMENT PAGE -----
VER 2005.1.8 Mountain Run 50 WSID = MR

JCT 1: confluence of Mountain Run (below MR11 dam) and unnam
(below MR8A dam)

PSH-Hydrograph No. 1, Peak = 1967.97 cfs at 120.92 hours. DA = 1.95
Hydrograph No. 2, Peak = 1095.08 cfs at 125.34 hours. DA = 12.04

PSH Add Hydrograph Results, Peak = 2130.33 cfs at 121.06 hours. DA = 13.99

HYDOUT 18 1

1SITES XEQ 05/21/2015 ----- COMMENT PAGE -----
VER 2005.1.8 Mountain Run 50 WSID = MR

Route Jct1 (Dam 8A + Dam11) to Jct 2 (USGS Gage)

Inflow Hyd 1 PSH-Peak = 2108.18 CFS at 121.36 hrs., Location Point
HYDOUT 17 MR2

1SITES XEQ 05/21/2015 ----- COMMENT PAGE -----
VER 2005.1.8 Mountain Run 50 WSID = MR

JCT2: Moutain Run and SR 641 (Gibson Mill Rd)

USGS Stream Gage 01665000

PSH-Hydrograph No. 1, Peak = 3354.82 cfs at 120.66 hours. DA = 2.15
Hydrograph No. 2, Peak = 2108.18 cfs at 121.36 hours. DA = 13.99

PSH Add Hydrograph Results, Peak = 4934.08 cfs at 120.88 hours. DA = 16.14

HYDOUT 15 2

1SITES XEQ 05/21/2015 ----- COMMENT PAGE -----
VER 2005.1.8 Mountain Run 50 WSID = MR

Route Jct2 (USGS gage) to Jct3 (MR50 reservoir)

Inflow Hyd 1 PSH-Peak = 4449.53 CFS at 121.54 hrs., Location Point
HYDOUT 14 MR3

1SITES XEQ 05/21/2015 ----- COMMENT PAGE -----
VER 2005.1.8 Mountain Run 50 WSID = MR

JCT 3: Mountain Run 50 Reservoir (Pelham Lake)

PSH-Hydrograph No. 1, Peak = 3877.88 cfs at 120.30 hours. DA = 1.93
Hydrograph No. 2, Peak = 4449.53 cfs at 121.54 hours. DA = 16.14

PSH Add Hydrograph Results, Peak = 5342.77 cfs at 120.67 hours. DA = 18.07

HYDOUT 12 3

PSH-Hydrograph No. 1, Peak = 1040.63 cfs at 122.84 hours. DA = 3.54
Hydrograph No. 2, Peak = 5342.77 cfs at 120.67 hours. DA = 18.07

PSH Add Hydrograph Results, Peak = 5401.13 cfs at 120.67 hours. DA = 21.61

1SITES XEQ 05/21/2015 ----- COMMENT PAGE -----
VER 2005.1.8 Mountain Run 50 WSID = MR

Mountain Run 50 Dam

Watershed Data - NLCD 2014, VGIN DEM 2014, SSURGO 2014

Elevation and stage/storage data - Topo Survey 2014

ASW profile - Asbuilt 1970

1SITES -----
XEQ 05/21/2015 Mountain Run 50 WSID= MR
VER 2005.1.8 MR50 sed survey 2014 SUBW= 50
TIME 10:56:32 SITE = 50 PASS= 1 PART= 13

***** BASIC Data ***** DESIGN CLASS S = USER DEFINED
CLIMATE AREA - NOT DEFINED

STORM DISTRIBUTION PSH..10 DAY NRCS DESIGN STORM (CHAPTER 21, NEH4 & TR-60).

STORM DISTRIBUTION USED FOR AUXILIARY SPILLWAY IS;
NRCS DESIGN STORM RAINFALL DISTRIBUTION (CHAPTER 21, NEH4 & TR-60).

PRECIP. - P-PS,1-DAY	P-PS,10-DAY	Q-SD	Q-FB	
8.53	12.70	0.00	0.00	
WSDATA - CN	DA-SM	TC/L	-/H	QRF
69.00	4.55	1.90	0.00	6.00
SITEDATA- PERM POOL	CREST PS	FP SED	VALLEY FL	378?
0.00	384.10	384.10	0.00	NO
BASEFLOW	INITIAL EL	EXTRA VOL	SITE TYPE	
5.00	0.00	0.00	DESIGN	
PSDATA - NO. COND	COND L	DIA/W	-/H	
1.00	192.00	66.00	0.00	
PS N	KE	WEIR L	TW EL	
0.013	0.90	44.00	361.50	

2ND STG	ORF H	ORF L	START AUX.		
0.00	0.00	0.00	0.00		
ASCRESTS -	AUX.1	AUX.2	AUX.3	AUX.4	AUX.5
	0.00	0.00	0.00	0.00	0.00
AUX.Data -	REF.NO.	RETARD. Ci	TIE STATION	INLET LENGTH	
	0	0.00	0.00	0	
AUX.Data -	INLET N	SIDE SLOPE	EXIT N	EXIT SLOPE	ACTUAL AUX?
	0.000	0.00	0.000	0.000	NO
BTM WIDTH -	BW1	BW2	BW3	BW4	BW5
	0.00	0.00	0.00	0.00	0.00
***** DETAILED LIST OF BASIC Data *****					
WEIR COEF. FOR ORIFICES.....	3.10	RATIO OF Ia TO S (CH.10,NEH4) ..	0.20		
WEIR COEF. FOR DROP INLET.....	3.10	TIME INCS TO PEAK OF UNIT HYD. ..	10.		
DISCHARGE COEF. FOR ORIFICES....	0.60	NO. POINTS FOR DESIGN HYD. ...	5000		
HOOD, WEIR INLET COEF.	0.60	DRAWDOWN TIME LIMIT - DAYS....	10.0		
HOOD, PIPE ENTRANCE COEF.	0.60	DRAWDOWN RATIO STORAGE LIMIT..	0.15		
HOOD, SLUG FLOW COEF.	0.00	OTHER DRAWDOWN RATIOS APPLY ?.	NO		
PS ACCURACY OF FULL FLOW CALC.,FT	0.01	WSP ALLOWABLE FSS VEL. CHANGE.	0.05		
FILLET SIZE FOR BOX CONDUITS.....	6.00	WSP FSS CALC. PRECISION, FT..	0.005		
GRAVITATIONAL CONSTANT.....	32.16	AUX. SPILLWAY MIN. CAP. COEF.	237.0		
MIN. NHCP378 PS PIPE AREA SQFT..	0.545	AUX. SPILLWAY MIN. CAP. EXP.	0.493		
MIN. TR60 DEPTH AUX. TO TOP DAM..	3.00	MIN. AUX. BW IN BW SOLUTION,FT	20.0		
MIN. NHCP378 DEPTH AUX.TO TOP DAM	2.00	PRECISION OF BW SOLUTION.....	1.0		
MIN. NHCP378 DEPTH PS - AUX.CREST	1.00	OLD TR60 CRITERIA USED	NO		
MIN. NHCP378 DEPTH DESIGN Q - TOD	1.00	OLD NHCP378 CRITERIA USED	NO		
EMBANKMENT TEMPLATE: TOP WIDTH = (calc.), MAX. CROWN = 0.667 ft,					
SIDE SLOPE	WAVE BERM	MULTIPLE STABILITY BERMS	SEPARATE STABILITY BERMS		
RATIOS	WIDTH	U&D/S WIDTHS	DELTA H	WIDTHS, ft	HEIGHTS, ft
U/S	D/S	ft	ft	U/S	D/S
2.50	2.50	10.0	0.0	0.00	0.00

DIMENSIONLESS UNIT HYDROGRAPH

PEAK FACTOR = 484.0 | TIME INC. =0.020 | NO. INC. TO PEAK = 10.
 VOLUME FACTOR = 48.3429

0.0000	0.0300	0.1000	0.1900	0.3100
0.4700	0.6600	0.8200	0.9300	0.9900
1.0000	0.9900	0.9300	0.8600	0.7800
0.6800	0.5600	0.4600	0.3900	0.3300
0.2800	0.2410	0.2070	0.1740	0.1470
0.1260	0.1070	0.0910	0.0770	0.0660
0.0550	0.0470	0.0400	0.0340	0.0290
0.0250	0.0210	0.0180	0.0150	0.0130
0.0110	0.0090	0.0080	0.0070	0.0060
0.0050	0.0040	0.0030	0.0020	0.0010
0.0000				

1NRCS DESIGN STORM RAINFALL DISTRIBUTION (CHAPTER 21, NEH4 & TR-60).

0.000	0.008	0.016	0.025	0.033
0.043	0.052	0.063	0.074	0.086
0.099	0.112	0.126	0.142	0.160
0.180	0.205	0.255	0.345	0.437
0.530	0.603	0.633	0.660	0.684
0.705	0.724	0.742	0.759	0.775
0.790	0.804	0.818	0.831	0.844
0.856	0.868	0.879	0.890	0.900
0.910	0.920	0.930	0.939	0.948
0.957	0.966	0.975	0.983	0.992
1.000				

1SITES -----

XEQ 05/21/2015	Mountain Run 50	WSID= MR
VER 2005.1.8	MR50 sed survey 2014	SUBW= 50
TIME 10:56:32	SITE = 50	PASS= 1
		PART= 14

Principal Spillway Runoff Distribution

Hour	1	2	3	4	5	6	7	8	9	10
1.	0.0003	0.0006	0.0009	0.0013	0.0016	0.0019	0.0022	0.0026	0.0029	0.0032
11.	0.0036	0.0039	0.0042	0.0046	0.0049	0.0053	0.0056	0.0060	0.0064	0.0067
21.	0.0071	0.0075	0.0079	0.0082	0.0086	0.0090	0.0094	0.0098	0.0102	0.0106
31.	0.0110	0.0114	0.0118	0.0122	0.0127	0.0131	0.0135	0.0140	0.0144	0.0149
41.	0.0153	0.0158	0.0162	0.0167	0.0172	0.0177	0.0182	0.0186	0.0191	0.0197
51.	0.0202	0.0207	0.0212	0.0218	0.0223	0.0229	0.0234	0.0240	0.0246	0.0251
61.	0.0257	0.0263	0.0270	0.0276	0.0282	0.0289	0.0295	0.0302	0.0309	0.0315
71.	0.0323	0.0330	0.0337	0.0345	0.0352	0.0360	0.0368	0.0376	0.0384	0.0393
81.	0.0402	0.0410	0.0420	0.0429	0.0439	0.0448	0.0459	0.0469	0.0480	0.0491
91.	0.0502	0.0514	0.0526	0.0539	0.0552	0.0566	0.0580	0.0594	0.0610	0.0626
101.	0.0643	0.0660	0.0679	0.0699	0.0720	0.0742	0.0766	0.0791	0.0819	0.0849
111.	0.0882	0.0919	0.0961	0.1008	0.1064	0.1133	0.1220	0.1343	0.1557	0.8216
121.	0.8567	0.8723	0.8825	0.8902	0.8963	0.9015	0.9059	0.9098	0.9133	0.9165
131.	0.9194	0.9220	0.9245	0.9268	0.9290	0.9310	0.9329	0.9347	0.9364	0.9381
141.	0.9396	0.9411	0.9426	0.9440	0.9453	0.9466	0.9478	0.9490	0.9502	0.9513
151.	0.9524	0.9535	0.9545	0.9555	0.9565	0.9574	0.9583	0.9592	0.9601	0.9610
161.	0.9618	0.9627	0.9635	0.9642	0.9650	0.9658	0.9665	0.9672	0.9679	0.9686
171.	0.9693	0.9700	0.9707	0.9713	0.9720	0.9726	0.9732	0.9738	0.9744	0.9750
181.	0.9756	0.9762	0.9767	0.9773	0.9778	0.9784	0.9789	0.9794	0.9799	0.9804
191.	0.9809	0.9814	0.9819	0.9824	0.9829	0.9834	0.9838	0.9843	0.9848	0.9852
201.	0.9857	0.9861	0.9865	0.9870	0.9874	0.9878	0.9882	0.9886	0.9891	0.9895
211.	0.9899	0.9903	0.9907	0.9910	0.9914	0.9918	0.9922	0.9926	0.9929	0.9933
221.	0.9937	0.9940	0.9944	0.9947	0.9951	0.9954	0.9958	0.9961	0.9965	0.9968
231.	0.9971	0.9975	0.9978	0.9981	0.9984	0.9987	0.9991	0.9994	0.9997	1.0000

UNCONTROLLED AREA HYDROGRAPH PSH - PEAK = 6478.12 CFS
 TIME TO PEAK = 120.72 HRS, SITE 50
 VOLUME = 1382.87 ACFT

ADDHYD RESULTS PS HYDROGRAPH - PEAK = 11821.93 CFS
 TIME TO PEAK = 120.74 HRS, SITE 50
 VOLUME = 10561.19 ACFT

CREST PS	384.10 FT	1724.3 ACFT	218.69 AC	675.6 CFS			
SED ACCUM	384.10 FT	1724.3 ACFT	218.69 AC	675.6 CFS			
BASEFLOW	384.31 FT	1770.7 ACFT	224.70 AC	22.8 CFS			
START ELEV	384.31 FT	1770.7 ACFT	224.70 AC	22.7 CFS			
NRCS-PSH	RAINFALL RUNOFF	1-DAY = 1-DAY =	8.53 IN 4.80 IN	10-DAY = 10-DAY =	12.70 IN 5.70 IN	DA =	4.55 SM

CLIMATIC INDEX = 1.40 CN 10-DAY = 51. CN 1-DAY = 69.
 QRF = 156.96 CFS 385.18 FEET, GIVEN Value.

PEAK = 11821.9 CFS, AT 120.7 HRS.
 ACCUMULATED SYSTEM DRAINAGE AREA = 26.16 SQUARE MILES.

ROUTED RESULT - HYD TYPE	EMAX	VOL-MAX	AMAX	QMAX
NRCS-PSH	393.54 FT	4951.1 ACFT	446.73 AC	679.3 CFS

PS STORAGE 3226.8 ACFT, BETWEEN AUX. CREST AND SED. ACCUM ELEVATIONS.

DRAWDOWN (DDT) TEST 386.20 FT 2247.8 ACFT 416.93 CFS
 CONTROL IS 0.150 DETENTION STORAGE

TIME TO DDT TEST DISCHARGE IS 5.72 DAYS - DRAWDOWN CONTINUING.

TIME LIMIT = 10.00 DAYS; FLOW WAS 158.66 CFS, ELEV = 385.18 FT

PLOT OF PRINCIPAL SPILLWAY HYDROGRAPH, 1 INCH= 2000. CFS
 0. 2000. 4000. 6000. 8000.

Time	Qin	Qout	Elev	Vol	Area	ExtVel	I	I	I	I	I
0.00	75	23	384.3	1771.1	224.7		.				
0.07	75	75	384.8	1876.4	237.8		.				
0.15	75	75	384.8	1876.4	237.8		.				
0.22	75	75	384.8	1876.4	237.8		.				
0.29	75	75	384.8	1876.4	237.8		.				
0.37	75	75	384.8	1876.4	237.8		.				
0.44	75	75	384.8	1876.4	237.8		.				
0.51	76	75	384.8	1876.4	237.8		.				
0.58	76	75	384.8	1876.4	237.8		.				
0.66	76	75	384.8	1876.4	237.8		.				
0.73	77	75	384.8	1876.5	237.8		.				
0.80	77	75	384.8	1876.5	237.8		.				
0.88	78	75	384.8	1876.5	237.8		.				
0.95	78	75	384.8	1876.5	237.8		.				
1.02	78	75	384.8	1876.5	237.8		.				
1.10	79	75	384.8	1876.6	237.8		.				
1.17	79	75	384.8	1876.6	237.8		.				
1.24	80	75	384.8	1876.6	237.8		.				
1.31	80	75	384.8	1876.6	237.8		.				
1.39	81	75	384.8	1876.7	237.9		.				
1.46	81	75	384.8	1876.7	237.9		.				
1.53	82	75	384.8	1876.8	237.9		.				
1.61	82	75	384.8	1876.8	237.9		.				
1.68	82	75	384.8	1876.8	237.9		.				
1.75	83	75	384.8	1876.9	237.9		.				

1.82	83	75	384.8	1876.9	237.9	.
1.90	83	75	384.8	1877.0	237.9	.
1.97	84	75	384.8	1877.0	237.9	.
2.04	84	75	384.8	1877.1	237.9	.
2.12	84	75	384.8	1877.2	237.9	.
2.19	85	75	384.8	1877.2	237.9	.
2.26	85	75	384.8	1877.3	237.9	.
2.34	85	75	384.8	1877.3	237.9	.
2.41	85	75	384.8	1877.4	237.9	.
2.48	86	75	384.8	1877.5	237.9	.
2.56	86	75	384.8	1877.5	238.0	.
2.63	86	75	384.8	1877.6	238.0	.
2.70	86	75	384.8	1877.7	238.0	.
2.77	87	75	384.8	1877.7	238.0	.
2.85	87	75	384.8	1877.8	238.0	.
2.92	87	75	384.8	1877.9	238.0	.
2.99	87	75	384.8	1877.9	238.0	.
3.07	88	75	384.8	1878.0	238.0	.
3.14	88	75	384.8	1878.1	238.0	.
3.21	88	75	384.8	1878.2	238.0	.
3.28	88	75	384.8	1878.2	238.0	.
3.36	88	76	384.8	1878.3	238.1	.
3.43	89	76	384.8	1878.4	238.1	.
3.50	89	76	384.8	1878.5	238.1	.
3.58	89	76	384.8	1878.6	238.1	.
3.65	89	76	384.8	1878.6	238.1	.
3.72	89	76	384.8	1878.7	238.1	.
3.80	90	76	384.8	1878.8	238.1	.
3.87	90	76	384.8	1878.9	238.1	.
3.94	90	76	384.8	1879.0	238.1	.
4.01	90	76	384.8	1879.0	238.1	.
4.09	90	76	384.8	1879.1	238.1	.
4.16	90	76	384.8	1879.2	238.2	.
4.23	90	76	384.8	1879.3	238.2	.
4.31	91	76	384.8	1879.4	238.2	.
4.38	91	77	384.8	1879.5	238.2	.
4.45	91	77	384.8	1879.5	238.2	.
4.53	91	77	384.8	1879.6	238.2	.
4.60	91	77	384.8	1879.7	238.2	.
4.67	91	77	384.8	1879.8	238.2	.
4.74	91	77	384.8	1879.9	238.2	.
4.82	91	77	384.8	1880.0	238.3	.
4.89	91	77	384.8	1880.1	238.3	.
4.96	92	77	384.8	1880.2	238.3	.
5.04	92	77	384.8	1880.2	238.3	.
5.11	92	77	384.8	1880.3	238.3	.
5.18	92	77	384.8	1880.4	238.3	.
5.26	92	77	384.8	1880.5	238.3	.
5.33	92	77	384.8	1880.6	238.3	.
5.40	92	78	384.8	1880.7	238.3	.
5.47	92	78	384.8	1880.8	238.3	.
5.55	92	78	384.8	1880.9	238.4	.
5.62	92	78	384.8	1880.9	238.4	.
5.69	92	78	384.8	1881.0	238.4	.
5.77	93	78	384.8	1881.1	238.4	.
5.84	93	78	384.8	1881.2	238.4	.
5.91	93	78	384.8	1881.3	238.4	.
5.99	93	78	384.8	1881.4	238.4	.
6.06	93	78	384.8	1881.5	238.4	.

6.13	93	78	384.8	1881.6	238.4	.
6.20	93	78	384.8	1881.7	238.5	.
6.28	93	78	384.8	1881.7	238.5	.
6.35	93	78	384.8	1881.8	238.5	.
6.42	93	79	384.8	1881.9	238.5	.
6.50	93	79	384.8	1882.0	238.5	.
6.57	93	79	384.8	1882.1	238.5	.
6.64	93	79	384.8	1882.2	238.5	.
6.72	93	79	384.8	1882.3	238.5	.
6.79	94	79	384.8	1882.4	238.5	.
6.86	94	79	384.8	1882.5	238.5	.
6.93	94	79	384.8	1882.5	238.6	.
7.01	94	79	384.8	1882.6	238.6	.
7.08	94	79	384.8	1882.7	238.6	.
7.15	94	79	384.8	1882.8	238.6	.
7.23	94	79	384.8	1882.9	238.6	.
7.30	94	79	384.8	1883.0	238.6	.
7.37	94	79	384.8	1883.1	238.6	.
7.45	94	80	384.8	1883.2	238.6	.
7.52	94	80	384.8	1883.2	238.6	.
7.59	94	80	384.8	1883.3	238.7	.
7.66	94	80	384.8	1883.4	238.7	.
7.74	94	80	384.8	1883.5	238.7	.
7.81	94	80	384.8	1883.6	238.7	.
7.88	94	80	384.8	1883.7	238.7	.
7.96	94	80	384.8	1883.8	238.7	.
8.03	94	80	384.8	1883.9	238.7	.
8.10	94	80	384.8	1883.9	238.7	.
8.18	95	80	384.8	1884.0	238.7	.
8.25	95	80	384.8	1884.1	238.7	.
8.32	95	80	384.8	1884.2	238.8	.
8.39	95	80	384.8	1884.3	238.8	.
8.47	95	81	384.8	1884.4	238.8	.
8.54	95	81	384.8	1884.5	238.8	.
8.61	95	81	384.8	1884.5	238.8	.
8.69	95	81	384.8	1884.6	238.8	.
8.76	95	81	384.8	1884.7	238.8	.
8.83	95	81	384.8	1884.8	238.8	.
8.91	95	81	384.8	1884.9	238.8	.
8.98	95	81	384.8	1885.0	238.9	.
9.05	95	81	384.8	1885.0	238.9	.
9.13	95	81	384.8	1885.1	238.9	.
9.20	95	81	384.8	1885.2	238.9	.
9.27	95	81	384.8	1885.3	238.9	.
9.34	95	81	384.8	1885.4	238.9	.
9.42	95	81	384.8	1885.5	238.9	.
9.49	95	82	384.8	1885.5	238.9	.
9.56	95	82	384.8	1885.6	238.9	.
9.64	95	82	384.8	1885.7	238.9	.
9.71	95	82	384.8	1885.8	239.0	.
9.78	95	82	384.8	1885.9	239.0	.
9.85	95	82	384.8	1886.0	239.0	.
9.93	96	82	384.8	1886.0	239.0	.
10.00	96	82	384.8	1886.1	239.0	.
10.07	96	82	384.8	1886.2	239.0	.
10.15	96	82	384.8	1886.3	239.0	.
10.22	96	82	384.8	1886.4	239.0	.
10.29	96	82	384.8	1886.4	239.0	.
10.37	96	82	384.8	1886.5	239.0	.

10.44	96	82	384.8	1886.6	239.0	.
10.51	96	82	384.8	1886.7	239.1	.
10.59	96	83	384.8	1886.8	239.1	.
10.66	96	83	384.8	1886.9	239.1	.
10.73	96	83	384.8	1886.9	239.1	.
10.80	96	83	384.8	1887.0	239.1	.
10.88	96	83	384.8	1887.1	239.1	.
10.95	96	83	384.8	1887.2	239.1	.
11.02	96	83	384.8	1887.2	239.1	.
11.10	96	83	384.8	1887.3	239.1	.
11.17	96	83	384.8	1887.4	239.1	.
11.24	96	83	384.8	1887.5	239.2	.
11.31	96	83	384.8	1887.6	239.2	.
11.39	96	83	384.8	1887.6	239.2	.
11.46	96	83	384.8	1887.7	239.2	.
11.53	96	83	384.8	1887.8	239.2	.
11.61	96	83	384.8	1887.9	239.2	.
11.68	96	84	384.8	1888.0	239.2	.
11.75	96	84	384.8	1888.0	239.2	.
11.83	96	84	384.8	1888.1	239.2	.
11.90	96	84	384.8	1888.2	239.2	.
11.97	96	84	384.8	1888.3	239.2	.
12.05	96	84	384.8	1888.3	239.3	.
12.12	97	84	384.8	1888.4	239.3	.
12.19	97	84	384.8	1888.5	239.3	.
12.26	97	84	384.8	1888.6	239.3	.
12.34	97	84	384.8	1888.6	239.3	.
12.41	97	84	384.8	1888.7	239.3	.
12.48	97	84	384.8	1888.8	239.3	.
12.56	97	84	384.8	1888.9	239.3	.
12.63	97	84	384.8	1888.9	239.3	.
12.70	97	84	384.8	1889.0	239.3	.
12.77	97	84	384.8	1889.1	239.3	.
12.85	97	85	384.8	1889.2	239.4	.
12.92	97	85	384.8	1889.2	239.4	.
12.99	97	85	384.8	1889.3	239.4	.
13.07	97	85	384.8	1889.4	239.4	.
13.14	97	85	384.8	1889.5	239.4	.
13.21	97	85	384.8	1889.5	239.4	.
13.29	97	85	384.8	1889.6	239.4	.
13.36	97	85	384.8	1889.7	239.4	.
13.43	97	85	384.8	1889.8	239.4	.
13.51	97	85	384.8	1889.8	239.4	.
13.58	97	85	384.8	1889.9	239.4	.
13.65	97	85	384.8	1890.0	239.5	.
13.72	97	85	384.8	1890.0	239.5	.
13.80	97	85	384.8	1890.1	239.5	.
13.87	97	85	384.8	1890.2	239.5	.
13.94	97	85	384.8	1890.3	239.5	.
14.02	97	85	384.8	1890.3	239.5	.
14.09	97	86	384.8	1890.4	239.5	.
14.16	97	86	384.8	1890.5	239.5	.
14.23	97	86	384.8	1890.5	239.5	.
14.31	97	86	384.8	1890.6	239.5	.
14.38	97	86	384.8	1890.7	239.5	.
14.45	97	86	384.8	1890.8	239.5	.
14.53	97	86	384.8	1890.8	239.6	.
14.60	98	86	384.8	1890.9	239.6	.
14.67	98	86	384.8	1891.0	239.6	.

14.75	98	86	384.8	1891.0	239.6	.							
14.82	98	86	384.8	1891.1	239.6	.							
14.89	98	86	384.8	1891.2	239.6	.							
14.97	98	86	384.8	1891.2	239.6	.							
15.04	98	86	384.8	1891.3	239.6	.							
15.11	98	86	384.8	1891.4	239.6	.							
15.18	98	86	384.8	1891.4	239.6	.							
15.26	98	86	384.8	1891.5	239.6	.							
15.33	98	87	384.8	1891.6	239.6	.							
15.40	98	87	384.8	1891.6	239.7	.							
15.48	98	87	384.8	1891.7	239.7	.							
15.55	98	87	384.8	1891.8	239.7	.							
15.62	98	87	384.8	1891.9	239.7	.							
15.69	98	87	384.8	1891.9	239.7	.							
15.77	98	87	384.8	1892.0	239.7	.							
15.84	98	87	384.8	1892.1	239.7	.							
15.91	98	87	384.8	1892.1	239.7	.							
15.99	98	87	384.8	1892.2	239.7	.							
16.06	98	87	384.8	1892.3	239.7	.							
16.13	98	87	384.8	1892.3	239.7	.							
16.21	98	87	384.8	1892.4	239.7	.							
16.28	98	87	384.8	1892.4	239.7	.							
16.35	98	87	384.8	1892.5	239.8	.							
16.42	98	87	384.8	1892.6	239.8	.							
16.50	98	87	384.8	1892.6	239.8	.							
16.57	98	87	384.8	1892.7	239.8	.							
16.64	98	88	384.8	1892.8	239.8	.							
16.72	98	88	384.8	1892.8	239.8	.							
16.79	98	88	384.8	1892.9	239.8	.							
16.86	98	88	384.8	1893.0	239.8	.							
16.94	98	88	384.8	1893.0	239.8	.							
17.01	98	88	384.8	1893.1	239.8	.							
17.08	98	88	384.8	1893.2	239.8	.							
17.16	98	88	384.8	1893.2	239.8	.							
17.23	98	88	384.8	1893.3	239.9	.							
17.30	99	88	384.8	1893.4	239.9	.							
17.37	99	88	384.8	1893.4	239.9	.							
17.45	99	88	384.8	1893.5	239.9	.							
Time	Qin	Qout	Elev	Vol	Area	ExtVel	I		I		I		I
							0.		2000.		4000.		6000.
													8000

END NRCS-PSH PLOT

RATING TABLE DEVELOPED, SITE = 50 :
WITH PS DEVELOPED BY PROGRAM AND NO AUX. DATA GIVEN.

RATING TABLE NUMBER 1					
	ELEV.	Q-TOTAL	Q-PS	Q-AUX.	VOLUME
	FEET	CFS	CFS	CFS	ACRE
1	384.10	0.00	0.00	0.00	1724.30
2	384.77	75.48	75.48	0.00	1878.23
3	385.45	213.50	213.50	0.00	2045.20
4	386.12	392.22	392.22	0.00	2225.21
				FULL CONDUIT FLOW, ELEV = 386.80 FT	
5	386.80	603.86	603.86	0.00	2418.27
6	389.95	640.41	640.41	0.00	3478.90
7	393.10	674.94	674.94	0.00	4753.16
					437.39

8	396.25	707.79	707.79	0.00	6235.02	506.21
9	399.40	739.18	739.18	0.00	7995.95	611.67
10	402.55	769.29	769.29	0.00	10057.18	692.06
11	405.70	798.27	798.27	0.00	12359.24	771.77
12	408.85	826.23	826.23	0.00	14925.69	861.55
13	412.00	853.28	853.28	0.00	17805.29	966.48

1SITES -----
 XEQ 05/21/2015 Mountain Run 50 WSID= MR
 VER 2005.1.8 MR50 sed survey 2014 SUBW= 50
 TIME 10:56:32 SITE = 50 PASS= 1 PART= 15

AUX. CREST 393.54 FT 4951.1 ACFT 446.73 AC 679.3 CFS
 PS STORAGE 3226.8 ACFT, BETWEEN AUX. CREST AND SED. ACCUM ELEVATIONS.
 START ELEV 385.18 FT 1977.3 ACFT 249.70 AC 158.7 CFS

ELEVATION OF LOW POINT IS ZERO. NO CRITERIA CHECK MADE FOR
 STRUCTURE CLASSIFICATION.

***** MESSAGE - NO INPUT DATA GIVEN FOR AUXILIARY SPILLWAY CREST AND/OR
 BOTTOM WIDTH. NO AUXILIARY SPILLWAY ROUTINGS PERFORMED.

Inflow Hyd 1 PSH-Peak = 679.33 CFS at 133.73 hrs., Location Point
 HYDOUT 1 50

1SITES....JOB NO. 1 COMPLETE.

MR Mountain Run 50

3 SUBWATERSHED(S) ANALYZED.

4 STRUCTURE(S) ANALYZED.

1 HYDROGRAPHS ROUTED AT LOWEST SITE.

0 TRIALS TO OBTAIN BOTTOM WIDTH FOR SPECIFIED STRESS OR VELOCITY.

SITES.....COMPUTATIONS COMPLETE

SUMMARY TABLE 1

SITES VERSION 2005.1.8
 DATED 01/01/2005

WATERSHED ID	RUN DATE	RUN TIME
-----	-----	-----
MR	05/21/2015	10:56:32

>>>		SITE ID	SUBWS ID	SUBWS DA (SQ MI)	CURVE NO.	TC (HRS)	TOTAL DA (SQ MI)	TYPE DESIGN	STRUC CLASS	<<<
PASS	NO.	DIA. / WIDTH (IN/FT)	AUX.CREST ELEV (FT)	BTM. WIDTH (FT)	MAX. HP (FT)	MAX. ELEV (FT)	EMB. VOL. (CY)	INTEGR.* DIST. (FT)	EXIT* VEL. (FT/SEC)	TYPE HYD
		13	13	3.54	74.	1.84	3.54	TR60	S	
		-----	-----	-----	-----	-----	-----	-----	-----	-----
>>>		SITE ID	SUBWS ID	SUBWS DA (SQ MI)	CURVE NO.	TC (HRS)	TOTAL DA (SQ MI)	TYPE DESIGN	STRUC CLASS	<<<
PASS	NO.	DIA. / WIDTH (IN/FT)	AUX.CREST ELEV (FT)	BTM. WIDTH (FT)	MAX. HP (FT)	MAX. ELEV (FT)	EMB. VOL. (CY)	INTEGR.* DIST. (FT)	EXIT* VEL. (FT/SEC)	TYPE HYD
		8A	8A	5.59	61.	3.05	5.59	TR60	S	
		-----	-----	-----	-----	-----	-----	-----	-----	-----
>>>		SITE ID	SUBWS ID	SUBWS DA (SQ MI)	CURVE NO.	TC (HRS)	TOTAL DA (SQ MI)	TYPE DESIGN	STRUC CLASS	<<<
PASS	NO.	DIA. / WIDTH (IN/FT)	AUX.CREST ELEV (FT)	BTM. WIDTH (FT)	MAX. HP (FT)	MAX. ELEV (FT)	EMB. VOL. (CY)	INTEGR.* DIST. (FT)	EXIT* VEL. (FT/SEC)	TYPE HYD
		11	11	6.45	67.	2.71	6.45	TR60	C	
		-----	-----	-----	-----	-----	-----	-----	-----	-----
>>>		SITE ID	SUBWS ID	SUBWS DA (SQ MI)	CURVE NO.	TC (HRS)	TOTAL DA (SQ MI)	TYPE DESIGN	STRUC CLASS	<<<
PASS	NO.	DIA. / WIDTH (IN/FT)	AUX.CREST ELEV (FT)	BTM. WIDTH (FT)	MAX. HP (FT)	MAX. ELEV (FT)	EMB. VOL. (CY)	INTEGR.* DIST. (FT)	EXIT* VEL. (FT/SEC)	TYPE HYD
		50	50	4.55	69.	1.90	26.16	TR60	S	
		-----	-----	-----	-----	-----	-----	-----	-----	-----

SITES.....SUMMARY TABLE 1 COMPLETED.

NRCS SITES VERSION 2005.1.8 ,01/01/2005
MR FILES

INPUT = E:\Mountain Run Watershed\SITES\MRPSHRain2.D2C
 OUTPUT = E:\Mountain Run Watershed\SITES\MRPSHRain2.OUT
 DATED 05/21/2015 10:56:32

FILE GEN. = E:\Mountain Run Watershed\SITES\MRPSHRain2.DEC DATED 05/21/2015 10:56

GRAPHICS FILES GENERATED

SITES XEQ 05/14/2015 WATER RESOURCE SITE ANALYSIS COMPUTER PROGRAM
VER 2005.1.8 (USER MANUAL - DATED DECEMBER 2005)
TIME 17:18:59

***** 80-80 LIST OF INPUT Data *****

SITES	01/01/2005MR	Mountain Run 50	26.16	I8	
SAVMOV	0 101				
SAVMOV	101 1			2	
*	Breach of Mountain Run 13 Dam				
*	TR60 criteria determined Qmin of 11,400cfs				
*	TR66 criteria used to develop Breach Hydrograph				
WSDATA	2 131	0			
HYD	9	MR13 BREACH			
	.1				
	0	11400	9793	8412	7226
	6208	5332	4581	3935	3380
	2904	2494	2143	1841	1581
	1358	1167	1002	861	740
	635	546	469	403	346
	297	255	219	188	162
	139	119	103	88	76
	65	56	48	41	35
	30	26	22	19	17
	14	12	10	9	8
	7	6	5	4	4
	3	3	2	2	2
	1	1	1	1	1
	1	1	1	0	1
	1	0			
ENDTABLE					
GO ,HYD					
SAVMOV	2 101 11		13		
SAVMOV	0 101				
SAVMOV	101 1				2
*	Uncontrolled Drainage Area above MR13 dam				
WSDATA	5S 131	74	3.54	1.84	
BASEFLOW		1			
STORM			24		1
RAINTABLE	5pt	24			
		0.000	0.042	0.819	0.958
					1.000
ENDTABLE					
GO ,STORM		5pt	36		
SAVMOV	2 101 20		13		
ADDMOV					
SAVMOV	101 2				3
*	Route MR13 to MR50 reservoir				
XSECTN	3 390	387			
	388.00	12.8	19.4	26.6	0.00100254
	390.00	324.8	379.4	371	0.00100254
	392.00	1838	1154	403	0.00100254
	394.00	4261	2030	468	0.00100254
	396.00	7809	2993	494	0.00100254
	398.00	12254	4008	521	0.00100254
	400.00	17572	5076	547	0.00100254
	402.00	23751	6196	573	0.00100254
	404.00	30789	7368	599	0.00100254
ENDTABLE					

GO ,REACH	1	MR13	3	2753	2500	6
SAVMOV	2	101	3		R13	
SAVMOV	0	101				
SAVMOV	101	1				2
*	Mountain Run 50 subwatershed 3					
WSDATA	5S	3	1	73	1.93	1.16
BASEFLOW				1		
PDIRECT			1.4			
STORM				24		1
RAINTABLE	5Pt			24	NRCS 5pt,	24 hr dim. RF distribution
				0.000	0.042	0.819 0.958 1.000
ENDTABLE						
GO ,STORM			5Pt	36		
SAVMOV	2	101	13		3	
SAVMOV	0	101				
SAVMOV	101	1				2
*	Mountain Run 50 subwatershed 2					
WSDATA	5S	2	1	71	2.15	1.75
BASEFLOW				1		
PDIRECT			1.4			
STORM				24		1
RAINTABLE	5PT			24	NRCS 5pt	24 hr dim. RF Distribution
				0.000	0.042	0.819 0.958 1.000
ENDTABLE						
GO ,STORM			5PT	36		
SAVMOV	2	101	16		2	
SAVMOV	0	101				
SAVMOV	101	1				2
*	Mountain Run Subwatershed 1					
WSDATA	5S	1	1	57	1.95	2.34
BASEFLOW				1		
PDIRECT			1.4			
STORM				24		1
RAINTABLE	5PT			24	5PT 24hr NRCS Dim.	RF Distribution
				0.000	0.042	0.819 0.958 1.000
ENDTABLE						
GO ,STORM			5PT	36		
SAVMOV	2	101	5		1	
SAVMOV	0	101				
SAVMOV	101	1				2
*	Uncontrolled Drainage Area to 8A Dam					
WSDATA	5S	8A1	61	5.59	3.05	
BASEFLOW				1		
STORM				24		1
RAINTABLE	5Pt			24		
				0.000	0.042	0.819 0.958 1.000
ENDTABLE						
GO ,STORM			5Pt	36		
SAVMOV	2	101	8		8A	
SAVMOV	0	101				
SAVMOV	101	1				2
*	BREACH of Mountain Run 8A dam					
*	TR60 criteria determined Qmin of 18,000cfs					
*	TR66 criteria used to develop breach hydrograph					
WSDATA	2	8A1		0		
HYD	9			MR8A BREACH		
			.1			
			0	18000	15489	13328
			9868	8491	7307	6287
						11468 5410

4655	4006	3447	2966	2552
2196	1890	1626	1399	1204
1036	891	767	660	568
489	421	362	311	268
231	198	171	147	126
109	94	81	69	60
51	44	38	33	28
24	21	18	15	13
11	10	8	7	6
5	5	4	3	3
3	2	2	2	1
1	1	1	1	1
1	0			

ENDTABLE

GO, HYD

SAVMOV

MOVING ADDMOV

SAVMOV

* route

XSECTN 6 415 412

250

112.50	1.51	3.03	11.7	0.00277360
415.00	152.3	71.4	44.3	0.00277360
418.00	1494	466.3	185	0.00277360
421.00	5087	1116	243	0.00277360
424.00	11050	1928	298	0.00277360
427.00	19666	2890	341	0.00277360
429.00	26914	3596	365	0.00277360
431.00	35390	4349	386	0.00277360

ENDTABLE

GO, READ

SAVMOV

SAVMOV

SAVMOV 101 1

* BREACH of Mountain Run 11 Dam

* Used TR60 criteria to determine Omin = 33,000 cfs

* Used TR66 criteria to determine Breach Hydrograph

WSDATA 2 111 0

HYD

.1				
0	33000	28454	24534	21154
18240	15727	13561	11693	10082
8693	7495	6463	5573	4805
4143	3572	3080	2656	2290
1974	1702	1468	1266	1091
941	811	700	603	520
448	387	333	287	248
214	184	159	137	118
102	88	76	65	56
49	42	36	31	27
23	20	17	15	13
11	10	8	7	6
5	5	4	3	3
3	2	2	2	1
1	1	1	1	1
1	0			

ENDTABLE

GO HYD

SAVMOV

SAVMOV

Page 3

SAVMOV	101	1				2
*	Uncontrolled Drainage Area to MR11 dam					
WSDATA	5S	111	67	6.45	2.71	
BASEFLOW			1			
STORM				24		1
RAINTABLE	5pt		24			
			0.000	0.042	0.819	0.958
					1.000	
ENDTABLE						
GO , STORM		5pt	36			
SAVMOV	2	101	4		11	
ADDMOV						
SAVMOV	101	2				3
*	route Dam 11 to junction 1					
XSECTN	7		410	401		
			402.00	1.99	3.56	7.74
			410.00	656.9	282.5	128
			415.00	4837	1636	338
			420.00	14055	3620	480
			424.50	28662	6315	666
ENDTABLE						
GO , REACH	1	MR11	7	7865	3900	6
SAVMOV	2	101	7		R11	
ADDMOV						
*	JCT 1: confluence of Mountain Run (below MR11 dam) and unnam (below MR8A dam)					
ADDMOV	18			1		4
SAVMOV	101	2				3
*	Route Jct1 (Dam 8A + Dam11) to Jct 2 (USGS Gage)					
XSECTN	17		401	396		
			396.00	0.15	0.67	7.45
			398.00	53.4	38.7	26.7
			400.00	201.9	113.3	52.9
			402.00	641.4	389.2	261
			404.00	2684	1210	515
			406.00	6685	2354	631
			408.00	12752	3711	718
			410.00	20775	5234	805
ENDTABLE						
GO , REACH	1	MMR2	17	5339	3035	6
SAVMOV	2	101	17		MR2	
*	JCT2: Moutain Run and SR 641 (Gibson Mill Rd)					
*	USGS Stream Gage 01665000					
ADDMOV	15			2		4
SAVMOV	101	2				3
*	Route Jct2 (USGS gage) to Jct3 (MR50 reservoir)					
XSECTN	14		387	383		
			384.00	2.54	5.89	16.3
			386.00	222.3	392.2	878
			388.00	3667	2790	1470
			390.00	12070	6095	1727
			392.00	24966	9617	1808
			394.00	41766	13316	1882
			396.00	62461	17128	1929
			398.00	86518	21035	1978
			400.00	114393	25022	2006
ENDTABLE						
GO , REACH	1	MMR3	14	6074	5500	6
SAVMOV	2	101	14		MR3	
*	JCT 3: Mountain Run 50 Reservoir (Pelham Lake)					

```

ADDMOV    12          3          4
ADDMOV
SAVMOV   101  1          1
*      Mountain Run 50 Dam - PSH Rainfall Run
*      Watershed Data - NLCD 2014, VGIN DEM 2014, SSURGO 2014
*      Elevation and stage/storage data - Topo Survey 2014
*      ASW profile - 2014 Survey
STRUCTURE 50      MR50 sed survey 2014
            363     0.00
            366     0.67
            370     25.92
            374     69.83
            378     129.47
            382     194.51
            384     215.82
            388     330.65
            392     414.51
            396     497.92
            400     631.82
            404     726.36
            408     833.26
            412     966.48
ENDTABLE
WSDATA    5C 50      69      4.55      1.9
BASEFLOW
STORM
RAINTABLE 5pt      24      NRCS 5pt, 24hr Dim. RF Distribution
                    0.000    0.042    0.819    0.958    1.000
ENDTABLE
POOLDATA  ELEV      384.1    384.1      SC
PSINLET
PSDATA    1          192      66          .013      361.5
ASSPRFL   41          CL of Flow
            0.0      371.52    100        372.67    200      376.05
            243.32    378.28    294.54    384.18    383.39    389.03
            393.41    389.04    450        390.3     480      390.3
            689.28    383.76    710.32    383.59    1189.37   365.14
            1268.43   364
ENDTABLE
ASSURFACE 41      1189      .02
            0      1268.43   0.03      0.87      2      1
ENDTABLE
ASDATA    41          3          2
BTMWIDTH  FEET      300
GRAPHICS I
GO,STORM  HLCTB      5pt      36          385.18
SAVMOV   2      101  1          50
ENDJOB
*****
```

1SITES XEQ 05/14/2015 ----- COMMENT PAGE -----
VER 2005.1.8 Mountain Run 50 WSID = MR

Breach of Mountain Run 13 Dam

TR60 criteria determined Qmin of 11,400cfs

TR66 criteria used to develop Breach Hydrograph

1SITES -----
XEQ 05/14/2015 Mountain Run 50 WSID= MR
VER 2005.1.8 SUBW= 13
TIME 17:18:59 PASS= 1 PART= 1

***** BASIC Data *****
HUMID- SUBHUMID CLIMATE AREA DESIGN CLASS *** NOT DEFINED

FLOOD HYDROGRAPH(S) USED

WSDATA - CN DA-SM TC/L -/H QRF
0.00 0.00 0.00 0.00 0.00

SITEDATA - BASEFLOW INITIAL EL EXTRA VOL SITE TYPE
0.00 0.00 0.00 NULL

INFLOW HYDROGRAPH PROVIDED IN LOCATION 9, PEAK= 11400.00 CFS, AT 0.10 HRS.
TITLE = MR13 BREACH

FLOOD HYD D= 0.00 HR P= 0.00 IN Q= 0.00 IN DA= 0.00 SM
TC= 0.00 HR CN= 0.00 VOL= 0.0 ACFT

PEAK = 11400.0 CFS, AT 0.1 HRS.

Input--Storm Hyd, Peak = 11400.00 CFS at 0.10 hrs., Location Point
HYDOUT 11 13

1SITES XEQ 05/14/2015 ----- COMMENT PAGE -----
VER 2005.1.8 Mountain Run 50 WSID = MR

Uncontrolled Drainage Area above MR13 dam

1SITES -----
XEQ 05/14/2015 Mountain Run 50 WSID= MR
VER 2005.1.8 SUBW= 13
TIME 17:18:59 PASS= 1 PART= 2

***** BASIC Data *****
CLIMATE AREA - NOT DEFINED DESIGN CLASS S = USER DEFINED

STORM DISTRIBUTION.....

PRECIP. - STORM RF DURATION RF TABLE
36.00 24.00 5pt

WSDATA - CN DA-SM TC/L -/H QRF
74.00 3.54 1.84 0.00 0.00

SITEDATA - BASEFLOW INITIAL EL EXTRA VOL SITE TYPE

1.00 0.00 0.00 NULL

STORM HYD D= 24.00 HR P= 36.00 IN Q= 32.10 IN DA= 3.54 SM
TC= 1.84 HR CN= 74.00 VOL= 6060.8 ACFT

PEAK = 10428.2 CFS, AT 12.0 HRS.

Inflow Hyd 1 PSH-Peak = 10428.18 CFS at 11.95 hrs., Location Point
HYDOUT 20 13

PSH-Hydrograph No. 1, Peak = 11400.00 cfs at 0.10 hours. DA = 0.00
Hydrograph No. 2, Peak = 10428.18 cfs at 11.95 hours. DA = 3.54

PSH Add Hydrograph Results, Peak = 11400.00 cfs at 0.20 hours. DA = 3.54

1SITES XEQ 05/14/2015 ----- COMMENT PAGE -----
VER 2005.1.8 Mountain Run 50 WSID = MR

Route MR13 to MR50 reservoir

Warning - Channel routing parameters Courant Number and Grid Reynolds Number are beyond acceptable limits
Warning - Channel routing parameters Courant Number and Grid Reynolds Number are beyond acceptable limits

Inflow Hyd 1 PSH-Peak = 10421.08 CFS at 12.10 hrs., Location Point
HYDOUT 3 R13

1SITES XEQ 05/14/2015 ----- COMMENT PAGE -----
VER 2005.1.8 Mountain Run 50 WSID = MR

Mountain Run 50 subwatershed 3

1SITES -----
XEQ 05/14/2015 Mountain Run 50 WSID= MR
VER 2005.1.8 SUBW= 3
TIME 17:18:59 PASS= 1 PART= 3

***** BASIC Data *****
CLIMATE AREA - NOT DEFINED DESIGN CLASS S = USER DEFINED

STORM DISTRIBUTION.....NRCS 5pt, 24 hr dim. RF distribution

PRECIP. - STORM RF DURATION RF TABLE
36.00 24.00 5Pt

WSDATA - CN DA-SM TC/L -/H QRF
73.00 1.93 1.16 0.00 0.00

SITEDATA - BASEFLOW INITIAL EL EXTRA VOL SITE TYPE
1.00 0.00 0.00 NULL

***** WARNING - CLIMATIC INDEX (PDIRECT) VALUE GREATER THAN 1.0
APPROPRIATE ONLY FOR LOWER SITE. VALUE SET TO 1.0

STORM HYD D= 24.00 HR P= 36.00 IN Q= 31.91 IN DA= 1.93 SM
TC= 1.16 HR CN= 73.00 VOL= 3284.9 ACFT

PEAK = 5705.8 CFS, AT 12.0 HRS.

Inflow Hyd 1 PSH-Peak = 5705.85 CFS at 11.99 hrs., Location Point
HYDOUT 13 3

1SITES XEQ 05/14/2015 ----- COMMENT PAGE -----
VER 2005.1.8 Mountain Run 50 WSID = MR

Mountain Run 50 subwatershed 2

1SITES -----
XEQ 05/14/2015 Mountain Run 50 WSID= MR
VER 2005.1.8 SUBW= 2
TIME 17:18:59 PASS= 1 PART= 4

***** BASIC Data *****
CLIMATE AREA - NOT DEFINED DESIGN CLASS S = USER DEFINED

STORM DISTRIBUTION....NRCS 5pt 24 hr dim. RF Distribution

PRECIP. - STORM RF DURATION RF TABLE
36.00 24.00 5PT

WSDATA - CN DA-SM TC/L -/H QRF
71.00 2.15 1.75 0.00 0.00

SITEDATA - BASEFLOW INITIAL EL EXTRA VOL SITE TYPE
1.00 0.00 0.00 NULL

***** WARNING - CLIMATIC INDEX (PDIRECT) VALUE GREATER THAN 1.0
APPROPRIATE ONLY FOR LOWER SITE. VALUE SET TO 1.0

STORM HYD D= 24.00 HR P= 36.00 IN Q= 31.52 IN DA= 2.15 SM
TC= 1.75 HR CN= 71.00 VOL= 3614.7 ACFT

PEAK = 6301.9 CFS, AT 12.0 HRS.

Inflow Hyd 1 PSH-Peak = 6301.85 CFS at 12.01 hrs., Location Point
HYDOUT 16 2

1SITES XEQ 05/14/2015 ----- COMMENT PAGE -----
VER 2005.1.8 Mountain Run 50 WSID = MR

Mountain Run Subwatershed 1

1SITES -----
XEQ 05/14/2015 Mountain Run 50 WSID= MR
VER 2005.1.8 SUBW= 1
TIME 17:18:59 PASS= 1 PART= 5

***** BASIC Data *****
CLIMATE AREA - NOT DEFINED DESIGN CLASS S = USER DEFINED

STORM DISTRIBUTION.....5PT 24hr NRCS Dim. RF Distribution

PRECIP. - STORM RF	DURATION	RF TABLE		
36.00	24.00	5PT		
WSDATA - CN	DA-SM	TC/L	-/H	QRF
57.00	1.95	2.34	0.00	0.00
SITEDATA - BASEFLOW	INITIAL EL	EXTRA VOL	SITE TYPE	
1.00	0.00	0.00	NULL	

***** WARNING - CLIMATIC INDEX (PDIRECT) VALUE GREATER THAN 1.0
APPROPRIATE ONLY FOR LOWER SITE. VALUE SET TO 1.0

STORM HYD D= 24.00 HR P= 36.00 IN Q= 28.30 IN DA= 1.95 SM
TC= 2.34 HR CN= 57.00 VOL= 2943.3 ACFT
PEAK = 5348.4 CFS, AT 12.2 HRS.

Inflow Hyd 1 PSH-Peak = 5348.36 CFS at 12.20 hrs., Location Point
HYDOUT 5 1

1SITES XEQ 05/14/2015 ----- COMMENT PAGE -----
VER 2005.1.8 Mountain Run 50 WSID = MR

Uncontrolled Drainage Area to 8A Dam

1SITES -----
XEQ 05/14/2015 Mountain Run 50 WSID= MR
VER 2005.1.8 SUBW= 8A
TIME 17:18:59 PASS= 1 PART= 6

***** BASIC Data *****
CLIMATE AREA - NOT DEFINED DESIGN CLASS S = USER DEFINED

STORM DISTRIBUTION.....

PRECIP. - STORM RF	DURATION	RF TABLE		
36.00	24.00	5Pt		
WSDATA - CN	DA-SM	TC/L	-/H	QRF
61.00	5.59	3.05	0.00	0.00

SITEDATA - BASEFLOW	INITIAL EL	EXTRA VOL	SITE TYPE
1.00	0.00	0.00	NULL

STORM HYD D= 24.00 HR P= 36.00 IN Q= 29.32 IN DA= 5.59 SM
TC= 3.05 HR CN= 61.00 VOL= 8741.8 ACFT

PEAK = 15149.3 CFS, AT 12.4 HRS.

Inflow Hyd 1 PSH-Peak = 15149.26 CFS at 12.41 hrs., Location Point HYDOUT 8 8A

1SITES XEQ 05/14/2015 ----- COMMENT PAGE -----
VER 2005.1.8 Mountain Run 50 WSID = MR

BREACH of Mountain Run 8A dam

TR60 criteria determined Qmin of 18,000cfs

TR66 criteria used to develop breach hydrograph

1SITES -----
 XEQ 05/14/2015 Mountain Run 50 WSID= MR
 VER 2005.1.8 SUBW= 8A
 TIME 17:18:59 PASS= 1 PART= 7

***** BASIC Data *****
HUMID- SUBHUMID CLIMATE AREA DESIGN CLASS S = USER DEFINED

FLOOD HYDROGRAPH(S) USED

WSDATA - CN DA-SM TC/L -/H QRF
0.00 0.00 0.00 0.00 0.00

SITEDATA - BASEFLOW INITIAL EL EXTRA VOL SITE TYPE
 1.00 0.00 0.00 NULL

INFLOW HYDROGRAPH PROVIDED IN LOCATION 9, PEAK= 18000.00 CFS, AT 0.10 HRS.
TITLE = MR8A BREACH

FLOOD HYD D= 0.00 HR P= 0.00 IN Q= 0.00 IN DA= 0.00 SM
TC= 0.00 HR CN= 0.00 VOL= 0.0 ACET

PEAK = 18000.0 CFS. AT 0.1 HRS.

Input--Storm Hyd, Peak = 18000.00 CFS at 0.10 hrs., Location Point
HYDOUT 9 8A

PSH-Hydrograph No. 1, Peak = 15149.26 cfs at 12.41 hours. DA = 5.59
Hydrograph No. 2, Peak = 18000.00 cfs at 0.10 hours. DA = 0.00

PSH Add Hydrograph Results, Peak = 18000.00 cfs at 0.20 hours. DA = 5.59

1SITES XEQ 05/14/2015 ----- COMMENT PAGE -----
VER 2005.1.8 Mountain Run 50 WSID = MR

route Dam 8A to junction 1

Inflow Hyd 1 PSH-Peak = 15136.51 CFS at 12.60 hrs., Location Point
HYDOUT 6 R8A

1SITES XEQ 05/14/2015 ----- COMMENT PAGE -----
VER 2005.1.8 Mountain Run 50 WSID = MR

BREACH of Mountain Run 11 Dam

Used TR60 criteria to determine Qmin = 33,000cfs

Used TR66 criteria to determine Breach Hydrograph

1SITES -----
XEQ 05/14/2015 Mountain Run 50 WSID= MR
VER 2005.1.8 SUBW= 11
TIME 17:18:59 PASS= 1 PART= 8

***** BASIC Data ***** DESIGN CLASS *** NOT DEFINED
HUMID- SUBHUMID CLIMATE AREA

FLOOD HYDROGRAPH(S) USED

WSDATA -	CN	DA-SM	TC/L	-/H	QRF
	0.00	0.00	0.00	0.00	0.00

SITEDATA -	BASEFLOW	INITIAL EL	EXTRA VOL	SITE TYPE
	0.00	0.00	0.00	NULL

INFLOW HYDROGRAPH PROVIDED IN LOCATION 9, PEAK= 33000.00 CFS, AT 0.10 HRS.
TITLE = MR 11 BREACH

FLOOD HYD D= 0.00 HR P= 0.00 IN Q= 0.00 IN DA= 0.00 SM
TC= 0.00 HR CN= 0.00 VOL= 0.0 ACFT

PEAK = 33000.0 CFS, AT 0.1 HRS.

Input--Storm Hyd, Peak = 33000.00 CFS at 0.10 hrs., Location Point
HYDOUT 2 11

1SITES XEQ 05/14/2015 ----- COMMENT PAGE -----
VER 2005.1.8 Mountain Run 50 WSID = MR

Uncontrolled Drainage Area to MR11 dam

1SITES -----
XEQ 05/14/2015
VER 2005.1.8
TIME 17:18:59

Mountain Run 50

WSID= MR
SUBW= 11
PART= 9

***** BASIC Data *****
CLIMATE AREA - NOT DEFINED DESIGN CLASS S = USER DEFINED

STORM DISTRIBUTION.....

PRECIP. - STORM RF DURATION RF TABLE
36.00 24.00 5pt

WSDATA - CN DA-SM TC/L -/H QRF
67.00 6.45 2.71 0.00 0.00

SITEDATA - BASEFLOW INITIAL EL EXTRA VOL SITE TYPE
1.00 0.00 0.00 NULL

STORM HYD D= 24.00 HR P= 36.00 IN Q= 30.70 IN DA= 6.45 SM
TC= 2.71 HR CN= 67.00 VOL= 10559.7 ACFT

PEAK = 18234.1 CFS, AT 12.3 HRS.

Inflow Hyd 1 PSH-Peak = 18234.14 CFS at 12.29 hrs., Location Point
HYDOUT 4 11

PSH-Hydrograph No. 1, Peak = 33000.00 cfs at 0.10 hours. DA = 0.00
Hydrograph No. 2, Peak = 18234.14 cfs at 12.29 hours. DA = 6.45

PSH Add Hydrograph Results, Peak = 33000.00 cfs at 0.20 hours. DA = 6.45

1SITES XEQ 05/14/2015 ----- COMMENT PAGE -----
VER 2005.1.8 Mountain Run 50 WSID = MR

route Dam 11 to junction 1

Warning - Channel routing parameters Courant Number and Grid Reynolds Number are beyond acceptable limits

Inflow Hyd 1 PSH-Peak = 21280.86 CFS at 0.50 hrs., Location Point
HYDOUT 7 R11

PSH-Hydrograph No. 1, Peak = 15136.51 cfs at 12.60 hours. DA = 5.59
Hydrograph No. 2, Peak = 21280.86 cfs at 0.50 hours. DA = 6.45

PSH Add Hydrograph Results, Peak = 35082.90 cfs at 0.60 hours. DA = 12.04

1SITES XEQ 05/14/2015 ----- COMMENT PAGE -----

VER 2005.1.8

Mountain Run 50

WSID = MR

JCT 1: confluence of Mountain Run (below MR11 dam) and unnam
(below MR8A dam)

PSH-Hydrograph No. 1, Peak = 5348.36 cfs at 12.20 hours. DA = 1.95
Hydrograph No. 2, Peak = 35082.90 cfs at 0.60 hours. DA = 12.04

PSH Add Hydrograph Results, Peak = 38591.23 cfs at 12.50 hours. DA = 13.99

HYDOUT 18 1

1SITES XEQ 05/14/2015 ----- COMMENT PAGE -----
VER 2005.1.8 Mountain Run 50 WSID = MR

Route Jct1 (Dam 8A + Dam11) to Jct 2 (USGS Gage)

Inflow Hyd 1 PSH-Peak = 38469.38 CFS at 12.60 hrs., Location Point
HYDOUT 17 MR2

1SITES XEQ 05/14/2015 ----- COMMENT PAGE -----
VER 2005.1.8 Mountain Run 50 WSID = MR

JCT2: Moutain Run and SR 641 (Gibson Mill Rd)

USGS Stream Gage 01665000

PSH-Hydrograph No. 1, Peak = 6301.85 cfs at 12.01 hours. DA = 2.15
Hydrograph No. 2, Peak = 38469.38 cfs at 12.60 hours. DA = 13.99

PSH Add Hydrograph Results, Peak = 44449.00 cfs at 12.50 hours. DA = 16.14

HYDOUT 15 2

1SITES XEQ 05/14/2015 ----- COMMENT PAGE -----
VER 2005.1.8 Mountain Run 50 WSID = MR

Route Jct2 (USGS gage) to Jct3 (MR50 reservoir)

Inflow Hyd 1 PSH-Peak = 44185.75 CFS at 12.60 hrs., Location Point
HYDOUT 14 MR3

1SITES XEQ 05/14/2015 ----- COMMENT PAGE -----
VER 2005.1.8 Mountain Run 50 WSID = MR

JCT 3: Mountain Run 50 Reservoir (Pelham Lake)

PSH-Hydrograph No. 1, Peak = 5705.85 cfs at 11.99 hours. DA = 1.93
Hydrograph No. 2, Peak = 44185.75 cfs at 12.60 hours. DA = 16.14

PSH Add Hydrograph Results, Peak = 49265.29 cfs at 12.35 hours. DA = 18.07

HYDOUT 12 3

PSH-Hydrograph No. 1, Peak = 10421.08 cfs at 12.10 hours. DA = 3.54
Hydrograph No. 2, Peak = 49265.29 cfs at 12.35 hours. DA = 18.07

PSH Add Hydrograph Results, Peak = 59640.99 cfs at 12.35 hours. DA = 21.61

1SITES XEQ 05/14/2015 ----- COMMENT PAGE -----
VER 2005.1.8 Mountain Run 50 WSID = MR

Mountain Run 50 Dam - PSH Rainfall Run

Watershed Data - NLCD 2014, VGIN DEM 2014, SSURGO 2014

Elevation and stage/storage data - Topo Survey 2014

ASW profile - 2014 Survey

***** MESSAGE - AUXILIARY SPILLWAY CREST ELEVATION IS SET TO 390.30
FROM THE ASSPRFL RECORDS.

1SITES -----
XEQ 05/14/2015 Mountain Run 50 WSID= MR
VER 2005.1.8 MR50 sed survey 2014 SUBW= 50
TIME 17:18:59 SITE = 50 PASS= 1 PART= 10

***** BASIC Data ***** DESIGN CLASS C
CLIMATE AREA - NOT DEFINED

STORM DISTRIBUTION.....NRCS 5pt, 24hr Dim. RF Distribution

PRECIP. - STORM RF DURATION RF TABLE
36.00 24.00 5pt

WSADATA - CN DA-SM TC/L - /H QRF
69.00 4.55 1.90 0.00 0.00

SITEDATA- PERM POOL CREST PS FP SED VALLEY FL 378?
0.00 384.10 384.10 0.00 NO

BASEFLOW INITIAL EL EXTRA VOL SITE TYPE
1.00 0.00 0.00 SIMULATION

PSDATA - NO. COND COND L DIA/W - /H
1.00 192.00 66.00 0.00

PS N KE WEIR L TW EL
0.013 0.90 44.00 361.50

2ND STG ORF H ORF L START AUX.
0.00 0.00 0.00 385.18

ASCRESTS -	AUX.1 390.30	AUX.2 0.00	AUX.3 0.00	AUX.4 0.00	AUX.5 0.00
AUX.Data -	REF.NO. 41	RETARD. Ci 0.00	TIE STATION 480.00	INLET LENGTH 0	
AUX.Data -	INLET N 0.030	SIDE SLOPE 3.00	EXIT N 0.030	EXIT SLOPE 0.031	ACTUAL AUX? NO
BTM WIDTH -	BW1 ft 300.00	BW2 0.00	BW3 0.00	BW4 0.00	BW5 0.00

AUXILIARY SPILLWAY RATING DEVELOPED USING WSPVRT.

***** DETAILED LIST OF BASIC Data *****					
WEIR COEF. FOR ORIFICES.....	3.10	RATIO OF Ia TO S (CH.10,NEH4). 0.20			
WEIR COEF. FOR DROP INLET.....	3.10	TIME INCS TO PEAK OF UNIT HYD. 10.			
DISCHARGE COEF. FOR ORIFICES.....	0.60	NO. POINTS FOR DESIGN HYD. ... 5000			
HOOD, WEIR INLET COEF.	0.60	DRAWDOWN TIME LIMIT - DAYS.... 10.0			
HOOD, PIPE ENTRANCE COEF.	0.60	DRAWDOWN RATIO STORAGE LIMIT.. 0.15			
HOOD, SLUG FLOW COEF.	0.00	OTHER DRAWDOWN RATIOS APPLY ?. NO			
PS ACCURACY OF FULL FLOW CALC.,FT	0.01	WSP ALLOWABLE FSS VEL. CHANGE. 0.05			
FILLET SIZE FOR BOX CONDUITS.....	6.00	WSP FSS CALC. PRECISION, FT.. 0.005			
GRAVITATIONAL CONSTANT.....	32.16	AUX. SPILLWAY MIN. CAP. COEF. 237.0			
MIN. NHCP378 PS PIPE AREA SQFT..	0.545	AUX. SPILLWAY MIN. CAP. EXP. 0.493			
MIN. TR60 DEPTH AUX. TO TOP DAM..	3.00	MIN. AUX. BW IN BW SOLUTION,FT 20.0			
MIN. NHCP378 DEPTH AUX.TO TOP DAM	2.00	PRECISION OF BW SOLUTION..... 1.0			
MIN. NHCP378 DEPTH PS - AUX.CREST	1.00	OLD TR60 CRITERIA USED NO			
MIN. NHCP378 DEPTH DESIGN Q - TOD	1.00	OLD NHCP378 CRITERIA USED NO			
EMBANKMENT TEMPLATE: TOP WIDTH = (calc.), MAX. CROWN = 0.667 ft,					
SIDE SLOPE	WAVE BERM	MULTIPLE STABILITY BERMS	SEPARATE STABILITY BERMS		
RATIOS	WIDTH	U&D/S WIDTHS	DELTA H	WIDTHS, ft	HEIGHTS, ft
U/S	D/S	ft	ft	U/S	D/S
2.50	2.50	10.0	0.0	0.00	0.00

DIMENSIONLESS UNIT HYDROGRAPH

PEAK FACTOR = 484.0 | TIME INC. =0.020 | NO. INC. TO PEAK = 10.
 VOLUME FACTOR = 48.3429

0.0000	0.0300	0.1000	0.1900	0.3100
0.4700	0.6600	0.8200	0.9300	0.9900
1.0000	0.9900	0.9300	0.8600	0.7800
0.6800	0.5600	0.4600	0.3900	0.3300
0.2800	0.2410	0.2070	0.1740	0.1470
0.1260	0.1070	0.0910	0.0770	0.0660
0.0550	0.0470	0.0400	0.0340	0.0290
0.0250	0.0210	0.0180	0.0150	0.0130
0.0110	0.0090	0.0080	0.0070	0.0060
0.0050	0.0040	0.0030	0.0020	0.0010
0.0000				

1NRCS DESIGN STORM RAINFALL DISTRIBUTION (CHAPTER 21, NEH4 & TR-60).

0.000	0.008	0.016	0.025	0.033
0.043	0.052	0.063	0.074	0.086
0.099	0.112	0.126	0.142	0.160
0.180	0.205	0.255	0.345	0.437
0.530	0.603	0.633	0.660	0.684
0.705	0.724	0.742	0.759	0.775
0.790	0.804	0.818	0.831	0.844
0.856	0.868	0.879	0.890	0.900
0.910	0.920	0.930	0.939	0.948
0.957	0.966	0.975	0.983	0.992
1.000				

NRCS 5pt, 24hr Dim. RF Distribution
IDENTIFICATION NAME IS 5pt GIVEN DURATION = 24.0 HRS

0.000	0.042	0.819	0.958	1.000
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1SITES -----
XEQ 05/14/2015 Mountain Run 50 WSID= MR
VER 2005.1.8 MR50 sed survey 2014 SUBW= 50
TIME 17:18:59 SITE = 50 PASS= 1 PART= 11

UNCONTROLLED AREA HYD - STORM PEAK = 13243.98 CFS
TIME TO PEAK = 12.09 HRS, SITE 50
VOLUME = 7551.37 ACFT

ADDHYD RESULTS STORM HYD - PEAK = 72806.48 CFS
TIME TO PEAK = 12.28 HRS, SITE 50
VOLUME = 46613.39 ACFT

CREST PS 384.10 FT 1724.3 ACFT 218.69 AC 614.4 CFS

SED ACCUM 384.10 FT 1724.3 ACFT 218.69 AC 614.4 CFS

BASEFLOW 384.14 FT 1733.6 ACFT 219.91 AC 4.6 CFS

AUX. CREST 390.30 FT 3611.5 ACFT 378.87 AC 644.4 CFS

PS STORAGE 1887.2 ACFT, BETWEEN AUX. CREST AND SED. ACCUM ELEVATIONS.

START ELEV 385.18 FT 1977.2 ACFT 249.69 AC 158.6 CFS

STORM HYD D= 24.00 HR P= 36.00 IN Q= 31.12 IN DA= 4.55 SM
TC= 1.90 HR CN= 69.00 VOL= 7551.4 ACFT

PEAK = 72806.5 CFS, AT 12.3 HRS.

ACCUMULATED SYSTEM DRAINAGE AREA = 26.16 SQUARE MILES.

RATING TABLE DEVELOPED, SITE = 50 :
BY PROGRAM FOR PS AND AUX. SPILLWAYS
AUX. RATING USED WSPVRT METHOD.

RATING TABLE NUMBER 2

	ELEV. FEET	Q-TOTAL CFS	Q-PS CFS	Q-AUX. CFS	VOLUME AC-FT	AREA ACRE
1	384.10	0.00	0.00	0.00	1724.30	218.69
2	384.77	75.48	75.48	0.00	1878.23	238.04
3	385.45	213.50	213.50	0.00	2045.20	257.39
4	386.12	392.22	392.22	0.00	2225.21	276.74
				FULL CONDUIT	FLOW, ELEV =	386.80 FT
5	386.80	603.86	603.86	0.00	2418.27	296.09
6	387.23	609.11	609.11	0.00	2550.71	308.66
7	387.67	614.28	614.28	0.00	2688.65	321.24
8	388.11	619.39	619.39	0.00	2832.06	332.96
9	388.55	624.47	624.47	0.00	2979.90	342.14
10	388.99	629.51	629.51	0.00	3131.77	351.32
11	389.42	634.50	634.50	0.00	3287.65	360.51
12	389.86	639.46	639.46	0.00	3447.56	369.69
13	390.30	644.38	644.38	0.00	3611.49	378.87
14	391.38	1446.35	656.40	789.95	4034.87	401.62
15	392.47	3116.64	668.21	2448.43	4482.96	424.31
16	394.42	7734.85	688.96	7045.89	5351.41	465.04
17	396.81	15366.65	713.50	14653.15	6524.99	525.03
18	401.15	34802.54	756.08	34046.47	9112.39	659.00
19	406.58	65701.94	806.14	64895.80	13045.52	795.18
20	412.00	104293.96	853.28	103440.69	17805.26	966.48

SUMMARY OF AUXILIARY SPILLWAY SURFACE CONDITIONS USED IN COMPUTATIONS BY REACH

REACH	FROM STA (ft)	TO STA (ft)	SLOPE (%)	RETARDANCE CURVE INDEX@	VEGETAL COVER FACTOR	MAINT. CODE	ROOTING DEPTH (ft)	REACH LOCATION *
1	0.	100.	-1.2	0.030	**	**	**	INLET
2	100.	200.	-3.4	0.030	**	**	**	INLET
3	200.	243.	-5.1	0.030	**	**	**	INLET
4	243.	295.	-11.5	0.030	**	**	**	INLET
5	295.	383.	-5.5	0.030	**	**	**	INLET
6	383.	393.	-0.1	0.030	**	**	**	INLET
7	393.	450.	-2.2	0.030	**	**	**	INLET
8	450.	480.	0.0	0.030	**	**	**	CREST
9	480.	689.	3.1	0.030	0.87	2	1.0	EXIT !
10	689.	710.	0.8	0.030	0.87	2	1.0	EXIT
11	710.	1189.	3.9	0.030	0.87	2	1.0	EXIT
12	1189.	1268.	1.4	0.030	0.87	2	1.0	exit

@ The program interprets retardance curve index entries of less than 1 as Manning's n values.

* Upper case indicates a reach of constructed spillway channel.

** The program does not use vegetal cover factor, maintenance code, and rooting depth for inlet and crest reaches in computations.

! Reach 9 used in computing exit channel velocities.

ROUTING OF STORM HYDROGRAPH STARTS AT ELEVATION 385.18

ROUTED RESULTS STORM HYD	BTM WIDTH FT	MAX ELEV FT	VOL-MAX ACFT	AREA-MAX AC	AUX.-HP FT	VOL-AUX. ACFT
	300.0	406.43	12927.0	791.2	16.13	9315.5

PEAK - CFS	Q-PS	Q-AUX.	Q-TOT.
DISCHARGE =	805.	63966.	64771.

	CRITICAL DEPTH	CRITICAL VELOCITY	CRITICAL SLOPE-Sc	25% OF Q Sc
AUXILIARY	FT	FT/SEC	FT/FT	FT/FT
SPILLWAY ---	10.81	17.81	0.006	0.008

***** WARNING - SOD STRIPPING WILL PROBABLY OCCUR DUE TO GROSSSTRESS LIMIT IN STABILITY CONTROL REACH WHICH STARTS AT STATION 710.32.

EROSIONALLY EFFECTIVE STRESS FOR STABILITY ANALYSIS OF AUX. EXIT CHANNEL (Refer to Ag. Handbook 667, Chapt. 3, for allowable stresses.)

Aux. Spillway Discharge = 63966. cfs; Bottom Width = 300. ft

REACH NO.	FROM STA	TO STA	SLOPE %	MANNING`S n	VELOCITY ft/s	TOTAL STRESS lb/ft^2	EFFECTIVE STRESS lb/ft^2
9	480.	689.	3.12	0.030	29.79	13.09	3.536
10	689.	710.	0.81	0.030	19.39	5.05	1.363
11	710.	1189.	3.85	0.030	31.81	15.17	4.097 max.

AUXILIARY SPILLWAY DURATION FLOW = 35.6 HOURS
ATTACK, OE/B = 148.6 ACFT/FT

EXIT CHANNEL FLOW SUPERCRITICAL: MAX VELOCITY= 29.8 FT/SEC
EXIT SLOPE = 0.031 FT/FT
FLOW DEPTH = 6.7 FT

Inflow Hyd 1 PSH-Peak = 64771.04 CFS at 12.94 hrs., Location Point
HYDOUT 1 50

1SITES....JOB NO. 1 COMPLETE.

MR Mountain Run 50

9 SUBWATERSHED(S) ANALYZED.

1 STRUCTURE(S) ANALYZED.

1 HYDROGRAPHS ROUTED AT LOWEST SITE.

0 TRIALS TO OBTAIN BOTTOM WIDTH FOR SPECIFIED STRESS OR VELOCITY.

SITES.....COMPUTATIONS COMPLETE

SUMMARY TABLE 1

SITES VERSION 2005.1.8

DATED 01/01/2005

WATERSHED ID				RUN DATE				RUN TIME		
-----				-----				-----		
MR				05/14/2015				17:18:59		
>>>	SITE ID	SUBWS ID	SUBWS DA (SQ MI)	CURVE NO.	TC (HRS)	TOTAL DA (SQ MI)	TYPE DESIGN	STRUC CLASS	<<<	
	50	50	4.55	69.	1.90	26.16	TR60	C		
PASS NO.	DIA. / WIDTH (IN/FT)	AUX.CREST ELEV (FT)	BTM. WIDTH (FT)	MAX. HP (FT)	MAX. ELEV (FT)	EMB. VOL. (CY)	INTEGR.* DIST. (FT)	EXIT* VEL. (FT/SEC)	TYPE HYD	
1	66.0	390.3	300.0	16.1	406.4	0.	0.	29.8	STORM HYD	

* INTEGRITY DIST. AND EXIT VEL. VALUES ARE BASED ON THE ROUTED HYDROGRAPH SHOWN UNDER TYPE HYD.

SITES.....SUMMARY TABLE 1 COMPLETED.

NRCS SITES VERSION 2005.1.8 ,01/01/2005
 MR FILES
 INPUT = E:\Mountain Run Watershed\SITES\MR50FBH24BRALL.D2C
 OUTPUT = E:\Mountain Run Watershed\SITES\MR50FBH24BRALL.OUT
 DATED 05/14/2015 17:18:59

FILE GEN. = E:\Mountain Run Watershed\SITES\MR50FBH24BRALL.DEC DATED 05/14/2015 1

GRAPHICS FILES GENERATED

OPTION "L" = E:\Mountain Run Watershed\SITES\MR50FBH24BRALL.DRG DATED 05/14/2015 17:18:59
 OPTION "P" = E:\Mountain Run Watershed\SITES\MR50FBH24BRALL.DHY DATED 05/14/2015 17:18:59
 OPTION "E" = E:\Mountain Run Watershed\SITES\MR50FBH24BRALL.DEM DATED 05/14/2015 17:18:59

Intentionally left

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SITES XEQ 05/21/2015 WATER RESOURCE SITE ANALYSIS COMPUTER PROGRAM
VER 2005.1.8 (USER MANUAL - DATED DECEMBER 2005)
TIME 08:37:26

***** 80-80 LIST OF INPUT Data *****

SITES	01/01/2005MR	Mountain Run 11	6.45	A1
SAVMOV	0 101			
SAVMOV	101 1			1
*	Mountain Run 11 Dam			
*	Watershed Data - NLCD 2014, VGIN DEM 2014, SSURGO 2014			
*	Elevation and stage/storage data - Topo Survey 2014			
*	ASW profile - Asbuilt 1958			
STRUCTURE 11	MR 11 2014 Sediment Survey			
	415 0.00			
	420 10.54			
	424 29.56			
	428 45.24			
	432 57.45			
	436 88.46			
	440 121.38			
	444 153.90			
	448 185.84			
	452 233.14			
	456 272.05			
	460 337.95			
ENDTABLE				
WSDATA	5C 11 67	6.45	2.71	6
BASEFLOW		1		
PDIRECT	1.4 8.53	12.7		
POOLDATA	ELEV	433.2	422.2	SC
PSINLET	.9	14		
PSDATA	1 208	30	0.013	411.2
GRAPHICS	I			
GO,DESIGN	LCPN			
SAVMOV	2 101 1	11		
ENDJOB				

1SITES XEQ 05/21/2015 ----- COMMENT PAGE -----
VER 2005.1.8 Mountain Run 11 WSID = MR

Mountain Run 11 Dam

Watershed Data - NLCD 2014, VGIN DEM 2014, SSURGO 2014

Elevation and stage/storage data - Topo Survey 2014

ASW profile - Asbuilt 1958

1SITES -----
XEQ 05/21/2015 Mountain Run 11 WSID= MR
VER 2005.1.8 MR 11 2014 Sediment Survey SUBW= 11
TIME 08:37:26 SITE = 11 PASS= 1 PART= 1

***** BASIC Data *****
CLIMATE AREA - NOT DEFINED DESIGN CLASS C

STORM DISTRIBUTION PSH..10 DAY NRCS DESIGN STORM (CHAPTER 21, NEH4 & TR-60).

STORM DISTRIBUTION USED FOR AUXILIARY SPILLWAY IS;
NRCS DESIGN STORM RAINFALL DISTRIBUTION (CHAPTER 21, NEH4 & TR-60).

PRECIP. - P-PS,1-DAY	P-PS,10-DAY	Q-SD	Q-FB
8.53	12.70	0.00	0.00
WSDATA - CN	DA-SM	TC/L	-/H
67.00	6.45	2.71	0.00
SITEDATA- PERM POOL	CREST PS	FP SED	VALLEY FL
0.00	433.20	422.20	0.00
BASEFLOW	INITIAL EL	EXTRA VOL	SITE TYPE
1.00	0.00	0.00	DESIGN
PSDATA - NO. COND	COND L	DIA/W	-/H
1.00	208.00	30.00	0.00
PS N	KE	WEIR L	TW EL
0.013	0.90	14.00	411.20
2ND STG	ORF H	ORF L	START AUX.
0.00	0.00	0.00	0.00
ASCRESTS - AUX.1	AUX.2	AUX.3	AUX.4
0.00	0.00	0.00	0.00
AUX.Data - REF.NO.	RETARD. Ci	TIE STATION	INLET LENGTH
0	0.00	0.00	0
AUX.Data - INLET N	SIDE SLOPE	EXIT N	EXIT SLOPE
0.000	0.00	0.000	0.000
BTM WIDTH - BW1	BW2	BW3	BW4
0.00	0.00	0.00	0.00
BW5			

***** DETAILED LIST OF BASIC Data *****

WEIR COEF. FOR ORIFICES.....	3.10	RATIO OF Ia TO S (CH.10,NEH4). .0.20
WEIR COEF. FOR DROP INLET.....	3.10	TIME INCS TO PEAK OF UNIT HYD. 10.
DISCHARGE COEF. FOR ORIFICES....	0.60	NO. POINTS FOR DESIGN HYD. ... 5000
HOOD, WEIR INLET COEF.	0.60	DRAWDOWN TIME LIMIT - DAYS.... 10.0
HOOD, PIPE ENTRANCE COEF.	0.60	DRAWDOWN RATIO STORAGE LIMIT.. 0.15
HOOD, SLUG FLOW COEF.	0.00	OTHER DRAWDOWN RATIOS APPLY ?. NO
PS ACCURACY OF FULL FLOW CALC.,FT	0.01	WSP ALLOWABLE FSS VEL. CHANGE. 0.05
FILLET SIZE FOR BOX CONDUITS.....	6.00	WSP FSS CALC. PRECISION, FT.. 0.005
GRAVITATIONAL CONSTANT.....	32.16	AUX. SPILLWAY MIN. CAP. COEF. 237.0
MIN. NHCP378 PS PIPE AREA SQFT..	0.545	AUX. SPILLWAY MIN. CAP. EXP. 0.493
MIN. TR60 DEPTH AUX. TO TOP DAM..	3.00	MIN. AUX. BW IN BW SOLUTION,FT 20.0
MIN. NHCP378 DEPTH AUX.TO TOP DAM	2.00	PRECISION OF BW SOLUTION..... 1.0

MIN. NHCP378 DEPTH PS - AUX.CREST 1.00 OLD TR60 CRITERIA USED NO
MIN. NHCP378 DEPTH DESIGN Q - TOD 1.00 OLD NHCP378 CRITERIA USED NO

EMBANKMENT TEMPLATE: TOP WIDTH = (calc.), MAX. CROWN = 0.667 ft,
 SIDE SLOPE WAVE BERM MULTIPLE STABILITY BERMS SEPARATE STABILITY BERMS
 RATIOS WIDTH U&D/S WIDTHS DELTA H WIDTHS, ft HEIGHTS, ft
 U/S D/S ft ft ft U/S D/S U/S D/S
 2.50 2.50 10.0 0.0 0.00 0.00 0.00 0.00 0.00

DIMENSIONLESS UNIT HYDROGRAPH

STANDARD DIMENSIONLESS UNIT HYDROGRAPH

PEAK FACTOR = 484.0 | TIME INC. = 0.020 | NO. INC. TO PEAK = 10.

VOLUME FACTOR = 48.3429

0.0000	0.0300	0.1000	0.1900	0.3100
0.4700	0.6600	0.8200	0.9300	0.9900
1.0000	0.9900	0.9300	0.8600	0.7800
0.6800	0.5600	0.4600	0.3900	0.3300
0.2800	0.2410	0.2070	0.1740	0.1470
0.1260	0.1070	0.0910	0.0770	0.0660
0.0550	0.0470	0.0400	0.0340	0.0290
0.0250	0.0210	0.0180	0.0150	0.0130
0.0110	0.0090	0.0080	0.0070	0.0060
0.0050	0.0040	0.0030	0.0020	0.0010
0.0000				

1NRCS DESIGN STORM RAINFALL DISTRIBUTION (CHAPTER 21, NEH4 & TR-60).

0.000	0.008	0.016	0.025	0.033
0.043	0.052	0.063	0.074	0.086
0.099	0.112	0.126	0.142	0.160
0.180	0.205	0.255	0.345	0.437
0.530	0.603	0.633	0.660	0.684
0.705	0.724	0.742	0.759	0.775
0.790	0.804	0.818	0.831	0.844
0.856	0.868	0.879	0.890	0.900
0.910	0.920	0.930	0.939	0.948
0.957	0.966	0.975	0.983	0.992
1.000				

1SITES -----
 XEQ 05/21/2015
 VER 2005.1.8
 TIME 08:37:26

Mountain Run 11
MR 11 2014 Sediment Survey
SITE = 11 PASS-

WSID= MR
SUBW= 11
BART= ?

Principal Spillway Runoff Distribution

Hour	1	2	3	4	5	6	7	8	9	10
1.	0.0003	0.0006	0.0009	0.0012	0.0015	0.0018	0.0021	0.0024	0.0027	0.0030
11.	0.0034	0.0037	0.0040	0.0043	0.0047	0.0050	0.0053	0.0057	0.0060	0.0063
21.	0.0067	0.0070	0.0074	0.0078	0.0081	0.0085	0.0089	0.0092	0.0096	0.0100
31.	0.0104	0.0107	0.0111	0.0115	0.0119	0.0123	0.0128	0.0132	0.0136	0.0140
41.	0.0144	0.0149	0.0153	0.0158	0.0162	0.0167	0.0171	0.0176	0.0181	0.0185
51.	0.0190	0.0195	0.0200	0.0205	0.0210	0.0216	0.0221	0.0226	0.0232	0.0237

61.	0.0243	0.0249	0.0254	0.0260	0.0266	0.0272	0.0278	0.0285	0.0291	0.0298
71.	0.0304	0.0311	0.0318	0.0325	0.0332	0.0340	0.0347	0.0355	0.0363	0.0371
81.	0.0379	0.0388	0.0396	0.0405	0.0414	0.0424	0.0433	0.0443	0.0453	0.0464
91.	0.0475	0.0486	0.0497	0.0509	0.0522	0.0535	0.0548	0.0562	0.0577	0.0592
101.	0.0608	0.0625	0.0642	0.0661	0.0681	0.0702	0.0725	0.0749	0.0775	0.0804
111.	0.0836	0.0871	0.0910	0.0956	0.1009	0.1075	0.1158	0.1276	0.1482	0.8299
121.	0.8638	0.8787	0.8885	0.8958	0.9017	0.9066	0.9109	0.9146	0.9179	0.9209
131.	0.9237	0.9262	0.9285	0.9307	0.9328	0.9347	0.9365	0.9382	0.9399	0.9414
141.	0.9429	0.9444	0.9457	0.9470	0.9483	0.9495	0.9507	0.9518	0.9529	0.9540
151.	0.9550	0.9560	0.9570	0.9580	0.9589	0.9598	0.9607	0.9615	0.9623	0.9632
161.	0.9640	0.9647	0.9655	0.9662	0.9670	0.9677	0.9684	0.9691	0.9697	0.9704
171.	0.9711	0.9717	0.9723	0.9729	0.9735	0.9741	0.9747	0.9753	0.9759	0.9764
181.	0.9770	0.9775	0.9780	0.9786	0.9791	0.9796	0.9801	0.9806	0.9811	0.9816
191.	0.9820	0.9825	0.9830	0.9834	0.9839	0.9843	0.9848	0.9852	0.9856	0.9861
201.	0.9865	0.9869	0.9873	0.9877	0.9881	0.9885	0.9889	0.9893	0.9897	0.9901
211.	0.9904	0.9908	0.9912	0.9916	0.9919	0.9923	0.9926	0.9930	0.9933	0.9937
221.	0.9940	0.9944	0.9947	0.9950	0.9954	0.9957	0.9960	0.9963	0.9967	0.9970
231.	0.9973	0.9976	0.9979	0.9982	0.9985	0.9988	0.9991	0.9994	0.9997	1.0000

CREST PS 433.20 FT 536.1 ACFT 66.75 AC 99.7 CFS

SED ACCUM 433.20 FT 536.1 ACFT 66.75 AC 99.7 CFS

BASEFLOW 433.43 FT 551.6 ACFT 68.53 AC 6.4 CFS

START ELEV 433.43 FT 551.6 ACFT 68.53 AC 6.5 CFS

NRCS-PSH RAINFALL 1-DAY = 8.53 IN 10-DAY = 12.70 IN DA = 6.45 SM
RUNOFF 1-DAY = 4.56 IN 10-DAY = 5.36 IN

CLIMATIC INDEX = 1.40 CN 10-DAY = 49. CN 1-DAY = 67.
QRF = 38.70 CFS 434.12 FEET, GIVEN Value.

PEAK = 6621.9 CFS, AT 121.2 HRS.

ROUTED RESULT - HYD TYPE EMAX VOL-MAX AMAX QMAX
NRCS-PSH 445.84 FT 2019.9 ACFT 168.57 AC 118.5 CFS

PS STORAGE 1483.8 ACFT, BETWEEN AUX. CREST AND SED. ACCUM ELEVATIONS.

DRAWDOWN (DDT) TEST 436.21 FT 771.8 ACFT 100.47 CFS
CONTROL IS 0.150 DETENTION STORAGE

TIME TO DDT TEST DISCHARGE IS 8.95 DAYS - DRAWDOWN CONTINUING.

TIME LIMIT = 10.00 DAYS; FLOW WAS 83.90 CFS, ELEV = 434.74 FT

Time	Qin	Qout	Elev	Vol	Area	ExtVel	CFS			
							0.	1000.	2000.	3000.
0.00	6	6	433.4	551.6	68.5	.	I	I	I	I
0.17	6	6	433.4	551.6	68.5	.				
0.34	7	6	433.4	551.6	68.5	.				
0.51	7	6	433.4	551.6	68.5	.				
0.68	7	6	433.4	551.6	68.5	.				
0.86	7	6	433.4	551.6	68.5	.				
1.03	7	6	433.4	551.6	68.5	.				

1.20	8	6	433.4	551.6	68.5	.
1.37	8	6	433.4	551.7	68.5	.
1.54	9	7	433.4	551.7	68.5	.
1.71	9	7	433.4	551.7	68.5	.
1.88	10	7	433.4	551.8	68.6	.
2.05	10	7	433.4	551.8	68.6	.
2.22	11	7	433.4	551.9	68.6	.
2.39	11	7	433.4	551.9	68.6	.
2.57	11	7	433.4	552.0	68.6	.
2.74	12	7	433.4	552.0	68.6	.
2.91	12	7	433.4	552.1	68.6	.
3.08	12	7	433.4	552.2	68.6	.
3.25	12	7	433.4	552.3	68.6	.
3.42	12	7	433.4	552.3	68.6	.
3.59	12	7	433.4	552.4	68.6	.
3.76	12	7	433.4	552.5	68.6	.
3.93	13	7	433.4	552.6	68.6	.
4.10	13	7	433.4	552.7	68.7	.
4.28	13	7	433.4	552.7	68.7	.
4.45	13	7	433.4	552.8	68.7	.
4.62	13	7	433.4	552.9	68.7	.
4.79	13	7	433.5	553.0	68.7	.
4.96	13	7	433.5	553.1	68.7	.
5.13	13	7	433.5	553.1	68.7	.
5.30	13	7	433.5	553.2	68.7	.
5.47	13	7	433.5	553.3	68.7	.
5.64	13	7	433.5	553.4	68.7	.
5.81	13	7	433.5	553.5	68.7	.
5.99	13	7	433.5	553.6	68.8	.
6.16	13	7	433.5	553.6	68.8	.
6.33	13	7	433.5	553.7	68.8	.
6.50	13	7	433.5	553.8	68.8	.
6.67	13	7	433.5	553.9	68.8	.
6.84	13	7	433.5	554.0	68.8	.
7.01	13	7	433.5	554.1	68.8	.
7.18	13	8	433.5	554.1	68.8	.
7.35	13	8	433.5	554.2	68.8	.
7.52	13	8	433.5	554.3	68.8	.
7.70	13	8	433.5	554.4	68.8	.
7.87	13	8	433.5	554.5	68.9	.
8.04	13	8	433.5	554.5	68.9	.
8.21	13	8	433.5	554.6	68.9	.
8.38	13	8	433.5	554.7	68.9	.
8.55	13	8	433.5	554.8	68.9	.
8.72	13	8	433.5	554.8	68.9	.
8.89	13	8	433.5	554.9	68.9	.
9.06	13	8	433.5	555.0	68.9	.
9.23	13	8	433.5	555.1	68.9	.
9.41	13	8	433.5	555.2	68.9	.
9.58	13	8	433.5	555.2	68.9	.
9.75	13	8	433.5	555.3	69.0	.
9.92	13	8	433.5	555.4	69.0	.
10.09	13	8	433.5	555.5	69.0	.
10.26	13	8	433.5	555.5	69.0	.
10.43	13	8	433.5	555.6	69.0	.
10.60	13	8	433.5	555.7	69.0	.
10.77	13	8	433.5	555.8	69.0	.
10.94	13	8	433.5	555.8	69.0	.
11.11	13	8	433.5	555.9	69.0	.

11.29	13	8	433.5	556.0	69.0	.
11.46	13	8	433.5	556.0	69.0	.
11.63	13	8	433.5	556.1	69.0	.
11.80	13	8	433.5	556.2	69.1	.
11.97	14	8	433.5	556.3	69.1	.
12.14	14	8	433.5	556.3	69.1	.
12.31	14	8	433.5	556.4	69.1	.
12.48	14	9	433.5	556.5	69.1	.
12.65	14	9	433.5	556.6	69.1	.
12.83	14	9	433.5	556.6	69.1	.
13.00	14	9	433.5	556.7	69.1	.
13.17	14	9	433.5	556.8	69.1	.
13.34	14	9	433.5	556.8	69.1	.
13.51	14	9	433.5	556.9	69.1	.
13.68	14	9	433.5	557.0	69.1	.
13.85	14	9	433.5	557.0	69.1	.
14.02	14	9	433.5	557.1	69.2	.
14.19	14	9	433.5	557.2	69.2	.
14.36	14	9	433.5	557.2	69.2	.
14.53	14	9	433.5	557.3	69.2	.
14.71	14	9	433.5	557.4	69.2	.
14.88	14	9	433.5	557.4	69.2	.
15.05	14	9	433.5	557.5	69.2	.
15.22	14	9	433.5	557.6	69.2	.
15.39	14	9	433.5	557.7	69.2	.
15.56	14	9	433.5	557.7	69.2	.
15.73	14	9	433.5	557.8	69.2	.
15.90	14	9	433.5	557.9	69.2	.
16.07	14	9	433.5	557.9	69.2	.
16.25	14	9	433.5	558.0	69.3	.
16.42	14	9	433.5	558.0	69.3	.
16.59	14	9	433.5	558.1	69.3	.
16.76	14	9	433.5	558.2	69.3	.
16.93	14	9	433.5	558.2	69.3	.
17.10	14	9	433.5	558.3	69.3	.
17.27	14	9	433.5	558.4	69.3	.
17.44	14	9	433.5	558.4	69.3	.
17.61	14	9	433.5	558.5	69.3	.
17.78	14	9	433.5	558.6	69.3	.
17.95	14	9	433.5	558.6	69.3	.
18.13	14	9	433.5	558.7	69.3	.
18.30	14	9	433.5	558.8	69.3	.
18.47	14	9	433.5	558.8	69.3	.
18.64	14	10	433.5	558.9	69.4	.
18.81	14	10	433.5	558.9	69.4	.
18.98	14	10	433.5	559.0	69.4	.
19.15	14	10	433.5	559.1	69.4	.
19.32	14	10	433.5	559.1	69.4	.
19.49	14	10	433.5	559.2	69.4	.
19.67	14	10	433.5	559.3	69.4	.
19.84	14	10	433.5	559.3	69.4	.
20.01	14	10	433.5	559.4	69.4	.
20.18	14	10	433.5	559.4	69.4	.
20.35	14	10	433.5	559.5	69.4	.
20.52	14	10	433.5	559.6	69.4	.
20.69	14	10	433.5	559.6	69.4	.
20.86	14	10	433.5	559.7	69.4	.
21.03	14	10	433.5	559.7	69.4	.
21.20	14	10	433.5	559.8	69.5	.

21.38	14	10	433.5	559.9	69.5	.
21.55	14	10	433.6	559.9	69.5	.
21.72	14	10	433.6	560.0	69.5	.
21.89	14	10	433.6	560.0	69.5	.
22.06	14	10	433.6	560.1	69.5	.
22.23	14	10	433.6	560.2	69.5	.
22.40	14	10	433.6	560.2	69.5	.
22.57	14	10	433.6	560.3	69.5	.
22.74	14	10	433.6	560.3	69.5	.
22.91	14	10	433.6	560.4	69.5	.
23.09	14	10	433.6	560.4	69.5	.
23.26	14	10	433.6	560.5	69.5	.
23.43	14	10	433.6	560.6	69.5	.
23.60	14	10	433.6	560.6	69.5	.
23.77	14	10	433.6	560.7	69.6	.
23.94	14	10	433.6	560.7	69.6	.
24.11	14	10	433.6	560.8	69.6	.
24.28	14	10	433.6	560.8	69.6	.
24.45	14	10	433.6	560.9	69.6	.
24.62	14	10	433.6	561.0	69.6	.
24.80	14	10	433.6	561.0	69.6	.
24.97	14	10	433.6	561.1	69.6	.
25.14	14	10	433.6	561.1	69.6	.
25.31	14	10	433.6	561.2	69.6	.
25.48	14	10	433.6	561.2	69.6	.
25.65	14	11	433.6	561.3	69.6	.
25.82	14	11	433.6	561.3	69.6	.
25.99	14	11	433.6	561.4	69.6	.
26.16	14	11	433.6	561.5	69.6	.
26.33	14	11	433.6	561.5	69.6	.
26.51	15	11	433.6	561.6	69.7	.
26.68	15	11	433.6	561.6	69.7	.
26.85	15	11	433.6	561.7	69.7	.
27.02	15	11	433.6	561.7	69.7	.
27.19	15	11	433.6	561.8	69.7	.
27.36	15	11	433.6	561.8	69.7	.
27.53	15	11	433.6	561.9	69.7	.
27.70	15	11	433.6	561.9	69.7	.
27.87	15	11	433.6	562.0	69.7	.
28.04	15	11	433.6	562.1	69.7	.
28.22	15	11	433.6	562.1	69.7	.
28.39	15	11	433.6	562.2	69.7	.
28.56	15	11	433.6	562.2	69.7	.
28.73	15	11	433.6	562.3	69.7	.
28.90	15	11	433.6	562.3	69.7	.
29.07	15	11	433.6	562.4	69.7	.
29.24	15	11	433.6	562.4	69.7	.
29.41	15	11	433.6	562.5	69.8	.
29.58	15	11	433.6	562.5	69.8	.
29.75	15	11	433.6	562.6	69.8	.
29.93	15	11	433.6	562.6	69.8	.
30.10	15	11	433.6	562.7	69.8	.
30.27	15	11	433.6	562.7	69.8	.
30.44	15	11	433.6	562.8	69.8	.
30.61	15	11	433.6	562.9	69.8	.
30.78	15	11	433.6	562.9	69.8	.
30.95	15	11	433.6	563.0	69.8	.
31.12	15	11	433.6	563.0	69.8	.
31.29	15	11	433.6	563.1	69.8	.

Time	Qin	Qout	Elev	Vol	Area	ExtVel	I 0.	I 1000.	I 2000.	I 3000.	I 4000
31.46	15	11	433.6	563.1	69.8	.					
31.64	15	11	433.6	563.2	69.8	.					
31.81	15	11	433.6	563.2	69.8	.					
31.98	15	11	433.6	563.3	69.8	.					
32.15	15	11	433.6	563.3	69.8	.					
32.32	15	11	433.6	563.4	69.9	.					
32.49	15	11	433.6	563.4	69.9	.					
32.66	15	11	433.6	563.5	69.9	.					
32.83	15	11	433.6	563.5	69.9	.					
33.00	15	11	433.6	563.6	69.9	.					
33.17	15	11	433.6	563.6	69.9	.					
33.35	15	11	433.6	563.7	69.9	.					
33.52	15	12	433.6	563.7	69.9	.					
33.69	15	12	433.6	563.8	69.9	.					
33.86	15	12	433.6	563.8	69.9	.					
34.03	15	12	433.6	563.9	69.9	.					
34.20	15	12	433.6	563.9	69.9	.					
34.37	15	12	433.6	564.0	69.9	.					
34.54	15	12	433.6	564.0	69.9	.					
34.71	15	12	433.6	564.1	69.9	.					
34.88	15	12	433.6	564.1	69.9	.					
35.06	15	12	433.6	564.2	69.9	.					
35.23	15	12	433.6	564.2	69.9	.					
35.40	15	12	433.6	564.3	70.0	.					
35.57	15	12	433.6	564.3	70.0	.					
35.74	15	12	433.6	564.4	70.0	.					
35.91	15	12	433.6	564.4	70.0	.					
36.08	15	12	433.6	564.5	70.0	.					
36.25	15	12	433.6	564.5	70.0	.					
36.42	15	12	433.6	564.6	70.0	.					
36.59	15	12	433.6	564.6	70.0	.					
36.76	15	12	433.6	564.7	70.0	.					
36.94	15	12	433.6	564.7	70.0	.					
37.11	15	12	433.6	564.8	70.0	.					
37.28	15	12	433.6	564.8	70.0	.					
37.45	15	12	433.6	564.9	70.0	.					
37.62	15	12	433.6	564.9	70.0	.					
37.79	16	12	433.6	565.0	70.0	.					
37.96	16	12	433.6	565.0	70.0	.					
38.13	16	12	433.6	565.1	70.0	.					
38.30	16	12	433.6	565.1	70.0	.					
38.48	16	12	433.6	565.2	70.1	.					
38.65	16	12	433.6	565.2	70.1	.					
38.82	16	12	433.6	565.3	70.1	.					
38.99	16	12	433.6	565.3	70.1	.					
39.16	16	12	433.6	565.4	70.1	.					
39.33	16	12	433.6	565.4	70.1	.					
39.50	16	12	433.6	565.5	70.1	.					
39.67	16	12	433.6	565.5	70.1	.					
39.84	16	12	433.6	565.6	70.1	.					
40.01	16	12	433.6	565.6	70.1	.					
40.19	16	12	433.6	565.6	70.1	.					
40.36	16	12	433.6	565.7	70.1	.					
40.53	16	12	433.6	565.7	70.1	.					
40.70	16	12	433.6	565.8	70.1	.					
40.87	16	12	433.6	565.8	70.1	.					

END NRCS-PSH PLOT

RATING TABLE DEVELOPED, SITE = 11 :
WITH PS DEVELOPED BY PROGRAM AND NO AUX. DATA GIVEN.

RATING TABLE NUMBER 1

	ELEV. FEET	Q-TOTAL CFS	Q-PS CFS	Q-AUX. CFS	VOLUME AC-FT	AREA ACRE
1	433.20	0.00	0.00	0.00	536.05	66.75
2	433.63	12.26	12.26	0.00	565.51	70.09
3	434.06	34.67	34.67	0.00	596.40	73.43
4	434.49	63.70	63.70	0.00	628.73	76.77
					FULL CONDUIT FLOW, ELEV =	434.92 FT
5	434.92	98.07	98.07	0.00	662.50	80.10
6	438.06	104.44	104.44	0.00	952.71	105.39
7	441.19	110.36	110.36	0.00	1323.43	131.07
8	444.33	115.99	115.99	0.00	1774.23	156.51
9	447.46	121.35	121.35	0.00	2304.07	181.54
10	450.60	126.49	126.49	0.00	2925.30	216.53
11	453.73	131.42	131.42	0.00	3659.04	249.97
12	456.87	136.18	136.18	0.00	4492.96	286.30
13	460.00	140.78	140.78	0.00	5471.40	337.95

1SITES -----
XEQ 05/21/2015 Mountain Run 11 WSID= MR
VER 2005.1.8 MR 11 2014 Sediment Survey SUBW= 11
TIME 08:37:26 SITE = 11 PASS= 1 PART= 3

AUX. CREST 445.84 FT 2019.9 ACFT 168.57 AC 118.5 CFS

PS STORAGE 1483.8 ACFT, BETWEEN AUX. CREST AND SED. ACCUM ELEVATIONS.

START ELEV 434.74 FT 648.4 ACFT 78.73 AC 83.9 CFS

ELEVATION OF LOW POINT IS ZERO. NO CRITERIA CHECK MADE FOR
STRUCTURE CLASSIFICATION.

***** MESSAGE - NO INPUT DATA GIVEN FOR AUXILIARY SPILLWAY CREST AND/OR
BOTTOM WIDTH. NO AUXILIARY SPILLWAY ROUTINGS PERFORMED.

Inflow Hyd 1 PSH-Peak = 118.47 CFS at 127.91 hrs., Location Point
HYDOUT 1 11

1SITES....JOB NO. 1 COMPLETE.

MR Mountain Run 11

0 SUBWATERSHED(S) ANALYZED.

1 STRUCTURE(S) ANALYZED.

1 HYDROGRAPHS ROUTED AT LOWEST SITE.

0 TRIALS TO OBTAIN BOTTOM WIDTH FOR SPECIFIED STRESS OR VELOCITY.

SITES.....COMPUTATIONS COMPLETE

SUMMARY TABLE 1

SITES VERSION 2005.1.8
DATED 01/01/2005

WATERSHED ID			RUN DATE				RUN TIME		
-----			-----				-----		
MR			05/21/2015				08:37:26		
>>>	SITE	SUBWS	SUBWS DA	CURVE	TC	TOTAL DA	TYPE	STRUC	<<<
	ID	ID	(SQ MI)	NO.	(HRS)	(SQ MI)	DESIGN	CLASS	-----
----	---	-----	-----	----	---	-----	-----	-----	-----
	11	11	6.45	67.	2.71	6.45	TR60	C	
PASS	DIA./ NO.	AUX.CREST WIDTH (IN/FT)	BTM. ELEV (FT)	MAX. HP (FT)	MAX. ELEV (FT)	EMB. VOL. (CY)	INTEGR.* DIST. (FT)	EXIT* VEL. (FT/SEC)	TYPE HYD
----	----	-----	-----	----	-----	-----	-----	-----	-----

SITES.....SUMMARY TABLE 1 COMPLETED.

NRCS SITES VERSION 2005.1.8 ,01/01/2005
MR FILES

INPUT = E:\Mountain Run Watershed\SITES\MR11PSHRain.D2C
OUTPUT = E:\Mountain Run Watershed\SITES\MR11PSHRain.OUT
DATED 05/21/2015 08:37:26

GRAPHICS FILES GENERATED

OPTION "L" = E:\Mountain Run Watershed\SITES\MR11PSHRain.DRG DATED 05/21/2015 08:37:26
OPTION "P" = E:\Mountain Run Watershed\SITES\MR11PSHRain.DHY DATED 05/21/2015 08:37:26
OPTION "E" = E:\Mountain Run Watershed\SITES\MR11PSHRain.DEM DATED 05/21/2015 08:37:26

SITES XEQ 05/21/2015 WATER RESOURCE SITE ANALYSIS COMPUTER PROGRAM
VER 2005.1.8 (USER MANUAL - DATED DECEMBER 2005)
TIME 11:08:44

***** 80-80 LIST OF INPUT Data *****

SITES	01/01/2005MR	Mountain Run 11	6.45	I8
SAVMOV	0 101			
SAVMOV	101 1			1
*	Mountain Run 11 Dam			
*	Watershed Data - NLCD 2014, VGIN DEM 2014, SSURGO 2014			
*	Elevation and stage/storage data - Topo Survey 2014			
*	ASW profile - Asbuilt 1958			
STRUCTURE 11	MR 11 2014 Sediment Survey			
	415	0.00		
	420	10.54		
	424	29.56		
	428	45.24		
	432	57.45		
	436	88.46		
	440	121.38		
	444	153.90		
	448	185.84		
	452	233.14		
	456	272.05		
	460	337.95		
ENDTABLE				
WSDATA	5C 11	67	6.45	2.71
BASEFLOW		1		
STORM		6		1
POOLDATA	ELEV	433.2		SC
PSINLET	.9	14		
PSDATA	1	208	30	
ASDATA	41 670	394		0.013
ASCREST	ELEV	444.1	3	0.03
ASINSURF	41		0.03	411.2
ASINLET	41	0.0	0.0	2
		55	2	0.0
			414	4.9
ENDTABLE				
ASEXSURF	41		0.03	3
			.87	
			1	
			1	0
			.01	
ENDTABLE				
ASEXIT	41	N		100
BTMWIDTH	FEET	150		
GRAPHICS	I			
GO,STORM	HLCPR	28		434.74
SAVMOV	2 101 1		11	
ENDJOB				

1SITES XEQ 05/21/2015 ----- COMMENT PAGE -----
VER 2005.1.8 Mountain Run 11 WSID = MR

Mountain Run 11 Dam

Watershed Data - NLCD 2014, VGIN DEM 2014, SSURGO 2014

Elevation and stage/storage data - Topo Survey 2014

ASW profile - Asbuilt 1958

1SITES -----
XEQ 05/21/2015 Mountain Run 11 WSID= MR
VER 2005.1.8 MR 11 2014 Sediment Survey SUBW= 11
TIME 11:08:44 SITE = 11 PASS= 1 PART= 1

***** BASIC Data *****
CLIMATE AREA - NOT DEFINED DESIGN CLASS C

STORM DISTRIBUTION USED FOR AUXILIARY SPILLWAY IS;
NRCS DESIGN STORM RAINFALL DISTRIBUTION (CHAPTER 21, NEH4 & TR-60).

PRECIP. - STORM RF	DURATION	RF TABLE
28.00	0.00	

WSDATA - CN	DA-SM	TC/L	-/H	QRF
67.00	6.45	2.71	0.00	0.00

SITEDATA- PERM POOL	CREST PS	FP SED	VALLEY FL	378?
0.00	433.20	0.00	0.00	NO

BASEFLOW	INITIAL EL	EXTRA VOL	SITE TYPE
1.00	0.00	0.00	SIMULATION

PSDATA - NO. COND	COND L	DIA/W	-/H
1.00	208.00	30.00	0.00

PS N	KE	WEIR L	TW EL
0.013	0.90	14.00	411.20

2ND STG	ORF H	ORF L	START AUX.
0.00	0.00	0.00	434.74

ASCRESTS - AUX.1	AUX.2	AUX.3	AUX.4	AUX.5
444.10	0.00	0.00	0.00	0.00

AUX.Data - REF.NO.	RETARD. Ci	TIE STATION	INLET LENGTH
41	0.00	670.00	394

AUX.Data - INLET N	SIDE SLOPE	EXIT N	EXIT SLOPE	ACTUAL AUX?
0.030	3.00	0.030	0.030	NO

BTM WIDTH - BW1	BW2	BW3	BW4	BW5
ft 150.00	0.00	0.00	0.00	0.00

AUXILIARY SPILLWAY RATING DEVELOPED USING WSPVRT.

***** DETAILED LIST OF BASIC Data *****
WEIR COEF. FOR ORIFICES..... 3.10 RATIO OF Ia TO S (CH.10,NEH4). 0.20
WEIR COEF. FOR DROP INLET..... 3.10 TIME INCS TO PEAK OF UNIT HYD. 10.

DISCHARGE COEF. FOR ORIFICES.....	0.60	NO. POINTS FOR DESIGN HYD. ...	5000	
HOOD, WEIR INLET COEF.	0.60	DRAWDOWN TIME LIMIT - DAYS....	10.0	
HOOD, PIPE ENTRANCE COEF.	0.60	DRAWDOWN RATIO STORAGE LIMIT..	0.15	
HOOD, SLUG FLOW COEF.	0.00	OTHER DRAWDOWN RATIOS APPLY ?.	NO	
PS ACCURACY OF FULL FLOW CALC.,FT	0.01	WSP ALLOWABLE FSS VEL. CHANGE.	0.05	
FILLET SIZE FOR BOX CONDUITS.....	6.00	WSP FSS CALC. PRECISION, FT..	0.005	
GRAVITATIONAL CONSTANT.....	32.16	AUX. SPILLWAY MIN. CAP. COEF.	237.0	
MIN. NHCP378 PS PIPE AREA SQFT..	0.545	AUX. SPILLWAY MIN. CAP. EXP.	0.493	
MIN. TR60 DEPTH AUX. TO TOP DAM..	3.00	MIN. AUX. BW IN BW SOLUTION,FT	20.0	
MIN. NHCP378 DEPTH AUX.TO TOP DAM	2.00	PRECISION OF BW SOLUTION.....	1.0	
MIN. NHCP378 DEPTH PS - AUX.CREST	1.00	OLD TR60 CRITERIA USED	NO	
MIN. NHCP378 DEPTH DESIGN Q - TOD	1.00	OLD NHCP378 CRITERIA USED	NO	
EMBANKMENT TEMPLATE: TOP WIDTH = (calc.), MAX. CROWN = 0.667 ft,				
SIDE SLOPE	WAVE BERM	MULTIPLE STABILITY BERMS	SEPARATE STABILITY BERMS	
RATIOS	WIDTH	U&D/S WIDTHS	DELTA H	WIDTHS, ft
U/S	D/S	ft	ft	HEIGHTS, ft
2.50	2.50	10.0	0.0	U/S D/S U/S D/S
			0.00	0.00 0.00 0.00 0.00

DIMENSIONLESS UNIT HYDROGRAPH

STANDARD DIMENSIONLESS UNIT HYDROGRAPH

PEAK FACTOR = 484.0 | TIME INC. = 0.020 | NO. INC. TO PEAK = 10.

VOLUME FACTOR = 48.3429

0.0000	0.0300	0.1000	0.1900	0.3100
0.4700	0.6600	0.8200	0.9300	0.9900
1.0000	0.9900	0.9300	0.8600	0.7800
0.6800	0.5600	0.4600	0.3900	0.3300
0.2800	0.2410	0.2070	0.1740	0.1470
0.1260	0.1070	0.0910	0.0770	0.0660
0.0550	0.0470	0.0400	0.0340	0.0290
0.0250	0.0210	0.0180	0.0150	0.0130
0.0110	0.0090	0.0080	0.0070	0.0060
0.0050	0.0040	0.0030	0.0020	0.0010
0.0000				

1NRCS DESIGN STORM RAINFALL DISTRIBUTION (CHAPTER 21, NEH4 & TR-60).

0.000	0.008	0.016	0.025	0.033
0.043	0.052	0.063	0.074	0.086
0.099	0.112	0.126	0.142	0.160
0.180	0.205	0.255	0.345	0.437
0.530	0.603	0.633	0.660	0.684
0.705	0.724	0.742	0.759	0.775
0.790	0.804	0.818	0.831	0.844
0.856	0.868	0.879	0.890	0.900
0.910	0.920	0.930	0.939	0.948
0.957	0.966	0.975	0.983	0.992
1.000				

1SITES -----
SEQ 05/21/2015 Mountain Run 11 WSID= MR

VER 2005.1.8
TIME 11:08:44

MR 11 2014 Sediment Survey
SITE = 11 PASS= 1 SUBW= 11
PART= 2

CREST PS	433.20 FT	536.1 ACFT	66.75 AC	98.7 CFS
SED ACCUM	433.20 FT	536.1 ACFT	66.75 AC	98.7 CFS
BASEFLOW	433.43 FT	551.6 ACFT	68.53 AC	6.4 CFS
AUX. CREST	444.10 FT	1739.0 ACFT	154.70 AC	115.6 CFS
PS STORAGE	1203.0 ACFT,	BETWEEN AUX. CREST AND SED. ACCUM ELEVATIONS.		
START ELEV	434.74 FT	648.0 ACFT	78.69 AC	83.5 CFS
STORM HYD	D= 6.00 HR	P= 28.00 IN	Q= 22.85 IN	DA= 6.45 SM
	TC= 2.71 HR	CN= 67.00	VOL= 7860.0 ACFT	
PEAK =	26883.8 CFS, AT	4.1 HRS.		

RATING TABLE DEVELOPED, SITE = 11 :
BY PROGRAM FOR PS AND AUX. SPILLWAYS
AUX. RATING USED WSPVRT METHOD.

RATING TABLE NUMBER 2

	ELEV. FEET	Q-TOTAL CFS	Q-PS CFS	Q-AUX. CFS	VOLUME AC-FT	AREA ACRE
1	433.20	0.00	0.00	0.00	536.05	66.75
2	433.63	12.26	12.26	0.00	565.51	70.09
3	434.06	34.67	34.67	0.00	596.40	73.43
4	434.49	63.70	63.70	0.00	628.73	76.77
				FULL CONDUIT FLOW, ELEV = 434.92 FT		
5	434.92	98.07	98.07	0.00	662.50	80.10
6	436.07	100.50	100.50	0.00	759.50	89.03
7	437.22	102.79	102.79	0.00	867.06	98.47
8	438.36	105.03	105.03	0.00	985.45	107.91
9	439.51	107.23	107.23	0.00	1114.67	117.36
10	440.66	109.38	109.38	0.00	1254.70	126.73
11	441.81	111.49	111.49	0.00	1405.44	136.06
12	442.95	113.56	113.56	0.00	1566.89	145.39
13	444.10	115.59	115.59	0.00	1739.03	154.70
14	444.90	371.43	116.98	254.45	1864.53	161.05
15	445.69	908.51	118.35	790.16	1995.08	167.39
16	447.12	2347.71	120.78	2226.93	2242.80	178.82
17	448.87	4730.98	123.69	4607.29	2569.22	196.13
18	452.05	10917.13	128.80	10788.33	3252.70	233.63
19	456.02	20962.65	134.92	20827.72	4258.21	272.46
20	460.00	33772.88	140.78	33632.10	5471.41	337.95

SUMMARY OF AUXILIARY SPILLWAY SURFACE CONDITIONS USED IN COMPUTATIONS BY REACH

REACH	FROM STA (ft)	TO STA (ft)	SLOPE (%)	RETARDANCE CURVE INDEX@	VEGETAL COVER FACTOR	MAINT. CODE	ROOTING DEPTH (ft)	REACH LOCATION *
-------	------------------	----------------	--------------	-------------------------------	----------------------------	----------------	--------------------------	------------------------

1	276.	615.	-0.8	0.030	**	**	**	INLET
2	615.	650.	-5.7	0.030	**	**	**	INLET
3	650.	670.	0.0	0.030	**	**	**	CREST
4	670.	770.	3.0	0.030	0.87	1	1.0	EXIT !

@ The program interprets retardance curve index entries of less than 1 as Manning's n values.

* Upper case indicates a reach of constructed spillway channel.

** The program does not use vegetal cover factor, maintenance code, and rooting depth for inlet and crest reaches in computations.

! Reach 4 used in computing exit channel velocities.

ROUTED RESULTS	BTM STORM HYD	WIDTH FT	MAX ELEV FT	VOL-MAX ACFT	AREA-MAX AC	AUX.-HP FT	VOL-AUX. ACFT
		150.0	454.72	3910.2	259.6	10.62	2171.2

PEAK - CFS DISCHARGE =	Q-PS 133.	Q-AUX. 17353.	Q-TOT. 17486.
---------------------------	--------------	------------------	------------------

	CRITICAL DEPTH	CRITICAL VELOCITY	CRITICAL SLOPE-Sc	25% OF Q Sc
AUXILIARY SPILLWAY ---	FT 7.10	FT/SEC 14.26	FT/FT 0.007	FT/FT 0.009

EROSIONALLY EFFECTIVE STRESS FOR STABILITY ANALYSIS OF AUX. EXIT CHANNEL
(Refer to Ag. Handbook 667, Chapt. 3, for allowable stresses.)

Aux. Spillway Discharge = 17353. cfs; Bottom Width = 150. ft

REACH NO.	FROM STA	TO STA	SLOPE %	MANNING`S n	VELOCITY ft/s	TOTAL STRESS lb/ft^2	EFFECTIVE STRESS lb/ft^2
4	670.	770.	3.00	0.030	22.61	8.77	0.308

AUXILIARY SPILLWAY DURATION FLOW =	19.5 HOURS
ATTACK, OE/B =	43.8 ACFT/FT

EXIT CHANNEL FLOW SUPERCRITICAL: MAX VELOCITY= 22.6 FT/SEC
EXIT SLOPE = 0.030 FT/FT
FLOW DEPTH = 4.7 FT

PLOT STORM HYD							1 IN = 5000. CFS	0.	5000.	10000.	15000.	20000.	I
Time	Qin	Qout	Elev	Vol	Area	ExtVel	I	I	I	I	I	I	I
0.50	6	83	434.7	647.6	78.6	0.00	.						
0.67	8	83	434.7	647.6	78.6	0.00	.						
0.84	16	82	434.7	646.6	78.5	0.00	.						
1.01	39	81	434.7	645.8	78.5	0.00	.						
1.18	89	81	434.7	645.6	78.4	0.00	.						
1.36	179	82	434.7	646.3	78.5	0.00	.						
1.53	331	84	434.7	648.7	78.8	0.00	.I						
1.70	567	89	434.8	653.9	79.3	0.00	.I						
1.87	911	98	434.9	663.0	80.2	0.00	. I						
2.04	1423	98	435.1	678.1	81.6	0.00	. I						
2.21	2254	99	435.4	702.7	83.9	0.00	. I						
2.38	3573	100	435.9	742.4	87.5	0.00	. I						

2.55	5447	101	436.6	804.8	93.1	0.00	.	I							
2.72	7872	103	437.5	897.4	101.0	0.00	.	I							
2.89	10845	106	438.8	1028.2	111.1	0.00	.	I							
3.07	14278	109	440.3	1204.2	123.5	0.00	.	I							
3.24	17825	112	442.0	1429.5	137.5	0.00	.	I							
3.41	21040	115	443.9	1702.5	152.8	0.00	.	I							
3.58	23600	996	445.8	2010.1	168.1	7.26	. A	A							
3.75	25404	2972	447.6	2328.3	182.6	11.49	. A	A							
3.92	26488	5338	449.2	2636.3	200.1	14.47	. A	A							
4.09	26884	7904	450.6	2919.8	216.2	16.82	. A	A							
4.26	26697	10175	451.7	3170.7	229.5	18.51	. A	A							
4.43	26029	12238	452.6	3384.9	239.1	19.83	. A	A							
4.60	24966	13986	453.3	3559.9	246.1	20.83	. A	A							
4.78	23550	15341	453.9	3695.5	251.4	21.55	. A	A							
4.95	21967	16319	454.3	3793.4	255.1	22.04	. A	A							
5.12	20446	16964	454.5	3858.0	257.6	22.36	. A	A							
5.29	19092	17334	454.7	3895.0	259.0	22.53	. A	A							
5.46	17883	17486	454.7	3910.2	259.6	22.61	. A	XI							
5.63	16792	17466	454.7	3908.3	259.5	22.60	. A	IA							
5.80	15802	17312	454.6	3892.8	258.9	22.52	. A	I A							
5.97	14889	17053	454.5	3866.9	257.9	22.40	. A	I A							
6.14	14029	16711	454.4	3832.6	256.6	22.24	. A	I A							
6.31	13211	16303	454.3	3791.8	255.1	22.04	. A	I A							
6.49	12422	15843	454.1	3745.8	253.3	21.81	. A	I A							
6.66	11633	15340	453.9	3695.4	251.4	21.55	. A	I A							
6.83	10816	14797	453.7	3641.1	249.3	21.27	. A	I A							
7.00	9952	14215	453.4	3582.8	247.0	20.96	. A	I A							
7.17	9047	13593	453.2	3520.6	244.5	20.61	. A	I A							
7.34	8129	12933	452.9	3454.5	241.9	20.24	. A	I A							
7.51	7221	12240	452.6	3385.1	239.1	19.83	. A	I A							
7.68	6351	11521	452.3	3313.1	236.1	19.39	. A	I A							
7.85	5524	10796	452.0	3239.3	233.1	18.92	. A	I A							
8.02	4765	10117	451.7	3164.3	229.2	18.47	. A	I A							
8.19	4076	9432	451.3	3088.6	225.3	17.99	. A	I A							
8.37	3459	8751	451.0	3013.4	221.3	17.49	. A	I A							
8.54	2921	8082	450.7	2939.5	217.3	16.97	. A	I A							
8.71	2473	7435	450.3	2868.0	213.4	16.44	. A	I A							
8.88	2101	6816	450.0	2799.6	209.6	15.90	. A	I A							
9.05	1787	6230	449.7	2734.9	205.9	15.36	. A	I A							
9.22	1520	5680	449.4	2674.1	202.4	14.82	. A	I A							
9.39	1295	5166	449.1	2617.3	199.0	14.29	. A	I A							
9.56	1103	4697	448.8	2564.6	195.8	13.77	. A	I A							
9.73	936	4336	448.6	2515.2	192.8	13.34	. A	I A							
9.91	792	3996	448.3	2468.5	190.0	12.92	. A	I A							
10.08	668	3675	448.1	2424.6	187.2	12.50	. A	I A							
10.25	559	3375	447.9	2383.5	185.0	12.09	. A	I A							
10.42	465	3094	447.7	2345.0	183.3	11.68	. A	I A							
10.59	383	2832	447.5	2309.1	181.8	11.27	. A	I A							
10.76	316	2588	447.3	2275.8	180.3	10.87	. A	I A							
10.93	263	2363	447.1	2244.9	178.9	10.47	. A	I A							
11.10	220	2193	447.0	2216.1	177.6	10.16	. A								
11.27	185	2036	446.8	2189.1	176.4	9.85	. A								
11.44	155	1888	446.7	2163.8	175.3	9.55	. A								
11.61	130	1751	446.5	2140.1	174.2	9.26	. A								
11.79	109	1622	446.4	2117.9	173.2	8.96	. A								
11.96	91	1502	446.3	2097.2	172.2	8.68	. A								
12.13	76	1390	446.2	2078.0	171.3	8.40	. A								
12.30	63	1286	446.1	2060.0	170.5	8.12	. A								
12.47	52	1189	446.0	2043.4	169.7	7.85	. A								

12.64	43	1099	445.9	2027.9	169.0	7.59	.	A
12.81	36	1015	445.8	2013.5	168.3	7.33	.	A
12.98	30	938	445.7	2000.2	167.6	7.07	.	A
13.15	24	878	445.6	1987.7	167.0	6.87	.	A
13.33	20	830	445.6	1976.0	166.5	6.69	.	A
13.50	16	784	445.5	1964.8	165.9	6.52	.	A
13.67	13	740	445.4	1954.2	165.4	6.35	.	A
13.84	10	699	445.4	1944.2	165.0	6.18	.	A
14.01	8	660	445.3	1934.8	164.5	6.01	.	A
14.18	7	623	445.3	1925.8	164.1	5.85	.	A
14.35	7	589	445.2	1917.3	163.6	5.69	.	A
14.52	6	556	445.2	1909.3	163.3	5.53	.	A
14.69	6	525	445.1	1901.8	162.9	5.37	.	A
14.86	6	495	445.1	1894.7	162.5	5.21	.	A
15.03	6	468	445.0	1888.0	162.2	5.06	.	A
15.21	6	442	445.0	1881.6	161.9	4.91	.	A
15.38	6	417	445.0	1875.6	161.6	4.76	.	A
15.55	6	394	444.9	1870.0	161.3	4.61	.	A
15.72	6	372	444.9	1864.7	161.1	4.46	.	A
15.89	6	361	444.9	1859.6	160.8	4.39	.	A
16.06	6	351	444.8	1854.6	160.6	4.31	.	A
16.23	6	341	444.8	1849.8	160.3	4.24	.	A
16.40	6	332	444.8	1845.2	160.1	4.17	.	A
16.57	6	323	444.7	1840.6	159.9	4.10	.	A
16.75	6	314	444.7	1836.2	159.6	4.03	.	A
16.92	6	305	444.7	1832.0	159.4	3.96	.	A
17.09	6	297	444.7	1827.8	159.2	3.88	.	A
17.26	6	288	444.6	1823.8	159.0	3.81	.	A
17.43	6	280	444.6	1819.8	158.8	3.74	.	A
17.60	6	273	444.6	1816.0	158.6	3.67	.	A
17.77	6	265	444.6	1812.3	158.4	3.60	.	A
17.94	6	258	444.5	1808.7	158.3	3.53	.	A
18.11	6	250	444.5	1805.2	158.1	3.46	.	A
18.28	6	244	444.5	1801.8	157.9	3.39	.	
18.45	6	237	444.5	1798.5	157.7	3.31	.	
18.63	6	230	444.5	1795.3	157.6	3.24	.	
18.80	6	224	444.4	1792.2	157.4	3.17	.	
18.97	6	218	444.4	1789.1	157.3	3.09	.	
19.14	6	212	444.4	1786.2	157.1	3.02	.	
19.31	6	206	444.4	1783.3	157.0	2.95	.	
19.48	6	200	444.4	1780.6	156.8	2.87	.	
19.65	6	195	444.3	1777.9	156.7	2.80	.	
19.82	6	189	444.3	1775.2	156.6	2.72	.	
19.99	6	184	444.3	1772.7	156.4	2.64	.	
20.17	6	179	444.3	1770.2	156.3	2.56	.	
20.34	6	174	444.3	1767.8	156.2	2.48	.	
20.51	6	169	444.3	1765.5	156.1	2.40	.	
20.68	6	165	444.3	1763.2	155.9	2.31	.	
20.85	6	160	444.2	1761.0	155.8	2.23	.	
21.02	6	156	444.2	1758.8	155.7	2.14	.	
21.19	6	152	444.2	1756.8	155.6	2.05	.	
21.36	6	148	444.2	1754.7	155.5	1.95	.	
21.53	6	144	444.2	1752.8	155.4	1.85	.	
21.70	6	140	444.2	1750.9	155.3	1.74	.	
21.88	6	136	444.2	1749.0	155.2	1.63*	.	
22.05	6	132	444.2	1747.2	155.1	1.50*	.	
22.22	6	129	444.1	1745.4	155.0	1.36*	.	
22.39	6	125	444.1	1743.7	154.9	1.21*	.	
22.56	6	122	444.1	1742.1	154.9	1.01*	.	

Time	Qin	Qout	Elev	Vol	Area	ExtVel	I	I	I	I	I	I
22.73	6	119	444.1	1740.5	154.8	0.75*	.					
22.90	6	116	444.1	1738.9	154.7	0.00	.					
							0.	5000.	10000.	15000.		200000

END STORM HYD PLOT

Inflow Hyd 1 PSH-Peak = 17486.05 CFS at 5.29 hrs., Location Point
HYDOUT 1 11

1SITES....JOB NO. 1 COMPLETE.

MR Mountain Run 11

0 SUBWATERSHED(S) ANALYZED.

1 STRUCTURE(S) ANALYZED.

1 HYDROGRAPHS ROUTED AT LOWEST SITE.

0 TRIALS TO OBTAIN BOTTOM WIDTH FOR SPECIFIED STRESS OR VELOCITY.

SITES.....COMPUTATIONS COMPLETE

SUMMARY TABLE 1

SITES VERSION 2005.1.8
DATED 01/01/2005

WATERSHED ID			RUN DATE				RUN TIME		
			-----				-----		
MR			05/21/2015				11:08:44		
>>>	SITE	SUBWS	SUBWS DA	CURVE	TC	TOTAL DA	TYPE	STRUC	<<<
	ID	ID	(SQ MI)	NO.	(HRS)	(SQ MI)	DESIGN	CLASS	
	11	11	6.45	67.	2.71	6.45	TR60	C	
PASS	DIA./	AUX.CREST	BTM.	MAX.	MAX.	EMB.	INTEGR.*	EXIT*	TYPE
NO.	WIDTH	ELEV	WIDTH	HP	ELEV	VOL.	DIST.	VEL.	HYD
	(IN/FT)	(FT)	(FT)	(FT)	(FT)	(CY)	(FT)	(FT/SEC)	
1	30.0	444.1	150.0	10.6	454.7	0.	0.	22.6	STORM HYD

* INTEGRITY DIST. AND EXIT VEL. VALUES ARE BASED ON THE ROUTED HYDROGRAPH SHOWN UNDER TYPE HYD.

SITES.....SUMMARY TABLE 1 COMPLETED.

Appendix D

Hydrologic Model Correlation

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Mountain Run Hydrologic Model - Comparison of USGS Gage 01665000 Frequency Analysis to SITES Existing Hydrologic Model
 April 2015

recurrence (years)	Stream Gage Frequency Analysis at Jct2			SITES - Existing Model using NRCS 24hr Type II at Jct2					SITES - Existing Model using NRCS NOAA Atlas 14	
	Q (cfs)	Q5 (cfs)	Q95 (cfs)	Ppt in	Q (Jct2) (cfs)	Comparis on (+- Q) (cfs)	+ - Q5 (cfs)	+ - Q95 (cfs)	Q (MR50) (cfs)	MR50 ASW flow depth (feet)
	100	5,100	8,753	3,478	8.53	3,282	-1,817	-5,470	-196	8,114
50	3,804	6,135	2,700	7.35	2,547	-1,257	-3,588	-153	6,314	-
25	2,783	4,211	2,057	6.30	1,920	-864	-2,291	-137	4,809	-
10	1,764	2,448	1,373	5.10	1,296	-468	-1,152	-76	3,217	-
5	1,185	1,543	953	4.29	927	-258	-616	-26	2,242	-
2	598	734	484	3.35	554	-43	-180	70	1,255	-
1.01	147	199	97	2.77	362	215	164	265	768	-

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USGS Gage 01665000 - Mountain Run near Culpeper VA

This button brings up a USGS web page of possible stations, (in your browser)

If you know an 8-digit USGS station number, this button goes to USGS on the web, loads a text file of data (below), and populates the 'basic data' sheet with it.

URL:http://nwis.waterdata.usgs.gov/nwis/peak?site_no=01665000&agency_cd=USGS&format=rdb

previous USGS download:

```
#  
# U.S. Geological Survey  
# National Water Information System  
# Retrieved: 2014-12-18 11:41:48 EST  
#  
# -----WARNING-----  
# The data you have obtained from this automated  
# U.S. Geological Survey database have not received  
# Director's approval and as such are provisional  
# and subject to revision. The data are released  
# on the condition that neither the USGS nor the  
# United States Government may be held liable for  
# any damages resulting from its use.  
#  
# More data may be available offline.  
# For more information on these data, contact USGS Water Data Inquiries.  
# This file contains the annual peak streamflow data.  
#  
# This information includes the following fields:  
#  
# agency_cd Agency Code  
# site_no USGS station number  
# peak_dt Date of peak streamflow (format YYYY-MM-DD)  
# peak_tm Time of peak streamflow (24 hour format, 00:00 - 23:59)  
# peak_va Annual peak streamflow value in cfs  
# peak_cd Peak Discharge-Qualification codes (see explanation below)  
# gage_ht Gage height for the associated peak streamflow in feet  
# gage_ht_cd Gage height qualification codes  
# year_last_pk Peak streamflow reported is the highest since this year  
# ag_dt Date of maximum gage-height for water year (if not concurrent)  
# ag_tm Time of maximum gage-height for water year (if not concurrent)  
# ag_gage_ht maximum Gage height for water year in feet (if not concurrent)  
# ag_gage_ht_cd maximum Gage height code  
#  
# Sites in this file include:  
USGS 01665000 MOUNTAIN RUN NEAR CULPEPER, VA  
#  
# Peak Streamflow-Qualification Codes(peak_cd):  
# 1 ... Discharge is a Maximum Daily Average  
# 2 ... Discharge is an Estimate  
# 3 ... Discharge affected by Dam Failure  
# 4 ... Discharge less than indicated value,  
#       which is Minimum Recordable Discharge at this site  
# 5 ... Discharge affected to unknown degree by  
#       Regulation or Diversion
```

USGS Gage 01665000 - Mountain Run near Culpeper VA

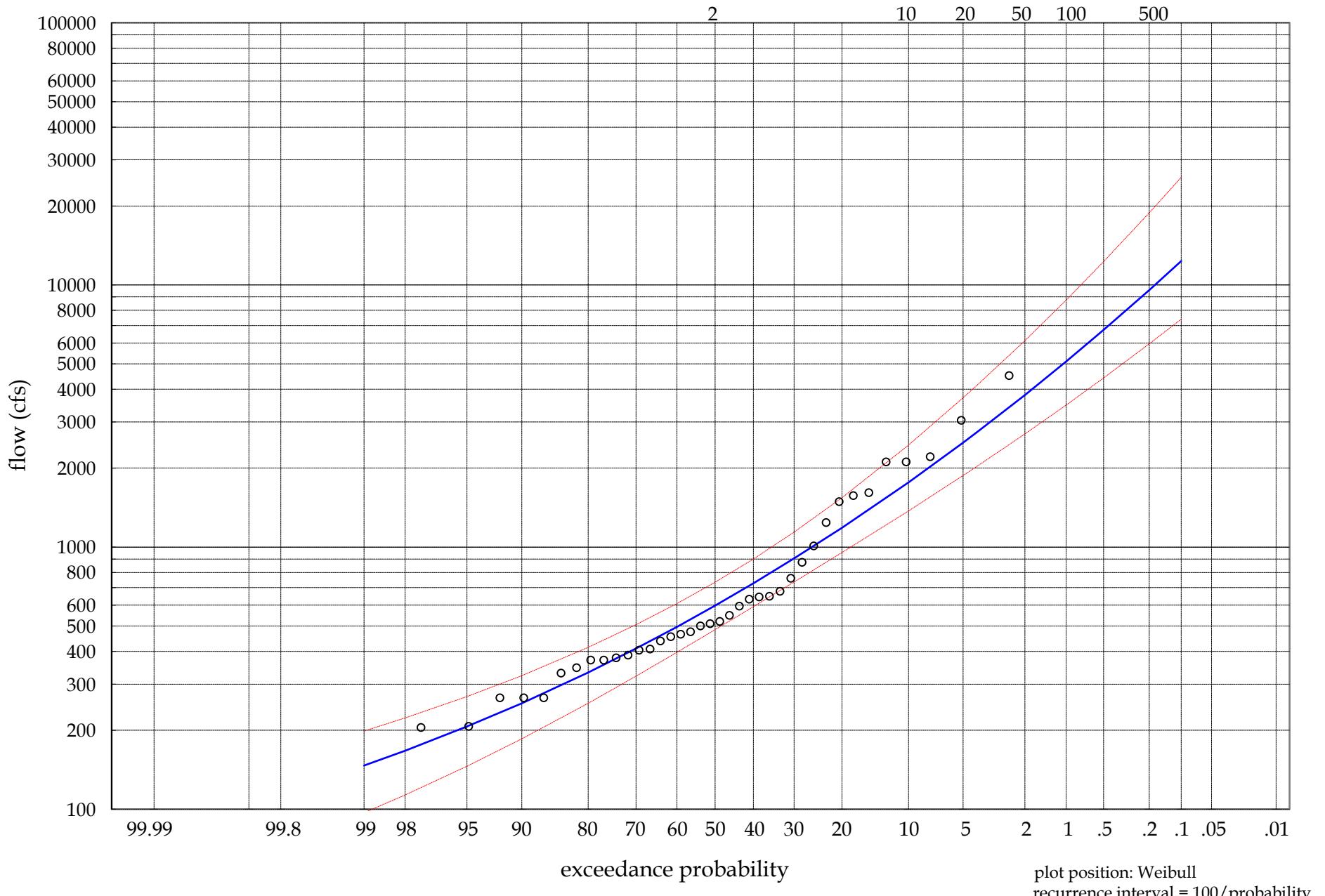
6 ... Discharge affected by Regulation or Diversion
7 ... Discharge is an Historic Peak
8 ... Discharge actually greater than indicated value
9 ... Discharge due to Snowmelt, Hurricane,
Ice-Jam or Debris Dam breakup
A ... Year of occurrence is unknown or not exact
B ... Month or Day of occurrence is unknown or not exact
C ... All or part of the record affected by Urbanization,
Mining, Agricultural changes, Channelization, or other
D ... Base Discharge changed during this year
E ... Only Annual Maximum Peak available for this year

Gage height qualification codes(gage_ht_cd,ag_gage_ht_cd):
1 ... Gage height affected by backwater
2 ... Gage height not the maximum for the year
3 ... Gage height at different site and(or) datum
4 ... Gage height below minimum recordable elevation
5 ... Gage height is an estimate
6 ... Gage datum changed during this year

#

agency_cd	site_no	peak_dt	peak_tm	peak_va	peak_cd	gage_ht
5s	15s	10d	6s	8s	27s	8s
USGS	1665000	9/10/1960		438	6	5.8
USGS	1665000	9/7/1961		465	6	5.93
USGS	1665000	5/1/1962		370	6	5.38
USGS	1665000	3/12/1963		266	6	4.75
USGS	1665000	1/9/1964		266	6	4.73
USGS	1665000	2/7/1965		455	6	5.9
USGS	1665000	2/13/1966		330	6	5.18
USGS	1665000	3/7/1967		475	6	6
USGS	1665000	1/14/1968		370	6	5.42
USGS	1665000	7/28/1969		2110	6	9.18
USGS	1665000	8/8/1970		266	6	4.77
USGS	1665000	11/12/1970		760	6	7.11
USGS	1665000	6/21/1972		3040	6	9.86
USGS	1665000	10/5/1972		387	6	5.51
USGS	1665000	12/21/1973		378	6	5.46
USGS	1665000	5/23/1975		632	6	6.66
USGS	1665000	12/31/1975		404	6	5.62
USGS	1665000	10/9/1976		2110	6	9.22
USGS	1665000	1/26/1978		595	6	6.48
USGS	1665000	9/22/1979		1610	6	8.74
USGS	1665000	3/21/1980		520	6	6.22
USGS	1665000	2/11/1981		207	6	4.26
USGS	1665000	8/6/1982		346	6	5.25
USGS	1665000	4/10/1983		645	6	6.5
USGS	1665000	2/14/1984		648	6	6.51
USGS	1665000	2/12/1985		408	6	5.3
USGS	1665000	11/3/1985		548	6	6.04
USGS	1665000	9/8/1987		2210	6	9.28
USGS	1665000	11/29/1987		510	6	5.85
USGS	1665000	5/5/1989		1240	6	8.1
USGS	1665000	7/14/1990		873	6	7.28
USGS	1665000	10/18/1990		678	6	6.64
USGS	1665000	7/27/1992		500	6	5.91
USGS	1665000	5/5/1993		4510	6	11.87
USGS	1665000	7/27/1994		1570	6	8.41
USGS	1665000	7/24/1995		1010	6	7.32
USGS	1665000	9/6/1996		1490	6	8.27
USGS	1665000	12/1/1996		205	6	4

USGS 01665000 MOUNTAIN RUN NEAR CULPEPER, VA



plot date: 5/26/2015

file: 01665000FreqCurves_ver305

plot position: Weibull
recurrence interval = 100/probability

USGS 01665000 MOUNTAIN RUN NEAR CULPEPER, VA

numbers in red are calculated from button in step 2

user enters numbers in blue

date (yr)	gage (ft)	peak (cfs)	log peak	X^2	X^3
9/10/1960	5.80	438	2.641	6.977	18.431
9/7/1961	5.93	465	2.667	7.115	18.980
5/1/1962	5.38	370	2.568	6.596	16.939
3/12/1963	4.75	266	2.425	5.880	14.258
1/9/1964	4.73	266	2.425	5.880	14.258
2/7/1965	5.90	455	2.658	7.065	18.779
2/13/1966	5.18	330	2.519	6.343	15.975
3/7/1967	6.00	475	2.677	7.165	19.178
1/14/1968	5.42	370	2.568	6.596	16.939
7/28/1969	9.18	2110	3.324	11.051	36.736
8/8/1970	4.77	266	2.425	5.880	14.258
11/12/1970	7.11	760	2.881	8.299	23.908
6/21/1972	9.86	3040	3.483	12.130	42.249
10/5/1972	5.51	387	2.588	6.696	17.328
12/21/1973	5.46	378	2.577	6.643	17.123
5/23/1975	6.66	632	2.801	7.844	21.969
12/31/1975	5.62	404	2.606	6.793	17.706
10/9/1976	9.22	2110	3.324	11.051	36.736
1/26/1978	6.48	595	2.775	7.698	21.358
9/22/1979	8.74	1610	3.207	10.284	32.978
3/21/1980	6.22	520	2.716	7.377	20.035
2/11/1981	4.26	207	2.316	5.364	12.422
8/6/1982	5.25	346	2.539	6.447	16.369
4/10/1983	6.50	645	2.810	7.894	22.178
2/14/1984	6.51	648	2.812	7.905	22.225
2/12/1985	5.30	408	2.611	6.816	17.793
11/3/1985	6.04	548	2.739	7.501	20.543
9/8/1987	9.28	2210	3.344	11.185	37.407
11/29/1987	5.85	510	2.708	7.331	19.849
5/5/1989	8.10	1240	3.093	9.569	29.602
7/14/1990	7.28	873	2.941	8.650	25.438
10/18/1990	6.64	678	2.831	8.016	22.695
7/27/1992	5.91	500	2.699	7.284	19.660
5/5/1993	11.87	4510	3.654	13.353	48.794
7/27/1994	8.41	1570	3.196	10.214	32.642
7/24/1995	7.32	1010	3.004	9.026	27.117
9/6/1996	8.27	1490	3.173	10.069	31.951
12/1/1996	4.00	205	2.312	5.344	12.354
			2.708	7.331	19.849
			3.093	9.569	29.602
			2.941	8.650	25.438
10/18/1990	6.64	678	2.831	8.016	22.695
7/27/1992	5.91	500	2.699	7.284	19.660
5/5/1993	11.87	4510	3.654	13.353	48.794
7/27/1994	8.41	1570	3.196	10.214	32.642
7/24/1995	7.32	1010	3.004	9.026	27.117
9/6/1996	8.27	1490	3.173	10.069	31.951
12/1/1996	4.00	205	2.312	5.344	12.354

mean log= 2.8062
 n= 38 years of record
 S= 0.3322 standard deviation
 G= 0.8030 computed "station" skew

Weighting the skew coefficient, G:
 genl G= 0.15 generalized skew
 genMSE_G= 0.302
 A= -0.2657575
 B= 0.73121
 MSE_G= 0.2043
 G_w= 0.53951203 weighted skew

Outlier tests:		K _N = 2.661
current high outliers	cutoff (cfs)	current low outliers
X _H = 3.6902	4900	X _L = 1.9222
outliers?=: NO		outliers?=>NO
# high = 0		# low = 0

Current frequency curve has no step 5 or 6 adjustments.

complete outliers list: # high # low hist.length
 0 0 0

code	date (yr)	(m)	(d)	gage (ft)	peak (cfs)	log peak	X^2	X^3
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USGS Gage 01665000 - Mountain Run near Culpeper, VA

recurrence (years)	Q (cfs)	Q ₅ (cfs)	Q ₉₅ (cfs)
1000	12,338	25,736	7,404
500	9,565	18,846	5,960
200	6,737	12,283	4,417
100	5,100	8,753	3,478
50	3,804	6,135	2,700
25	2,783	4,211	2,057
20	2,504	3,710	1,874
10	1,764	2,448	1,373
5	1,185	1,543	953
3.333	905	1,141	736
2.5	727	900	592
2	598	734	484
1.667	496	608	397
1.429	410	505	322
1.250	332	414	254
1.111	254	323	186
1.053	207	269	146
1.020	167	223	113
1.010	147	199	97